

THE GREAT WAR IN THE AIR

The Great War in
the Air : By Edgar
Middleton (late R.N.A.S. and R.A.F.)
With an Introduction by
Brigadier - General Lord
Montagu of Beaulieu, C.S.I., V.D.

VOLUME I

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CONTENTS

VOLUME I

CHAPTER I

THE ADVENT OF THE FOURTH WING

	PAGE
A German Air-Raid—Cause and Effect—Mustering of the Forces —A Brief Glimpse into the History of Aviation—Comparison of Aerial Powers on the Outbreak of Hostilities—Germany's Extensive Preparations for Aerial Warfare	1

CHAPTER II

THE ROYAL FLYING CORPS

Inception—Aircraft Construction in Great Britain—At the War— Attitude of the British Public—In the Retreat—Reconnaissance —The Direction of Artillery Fire—Bomb-Raiding—First Raid on the Rhine Airship Sheds	19
--	----

CHAPTER III

THE AUTUMN CAMPAIGN IN THE AIR

In the Eastern Theatre of War—Exploits of Kusminsky, the First Russian "Ace"—German Zeppelins meet with Disaster— German Airman at War—Tactical Air-Raid—A Great Advent- ure—Violating the Hague Convention—The French Aerial Front—Individualism in the Air—Vedrine and "La Vache"	36
---	----

CHAPTER IV

THE ROYAL NAVAL AIR SERVICE

Faulty Organisation—The Gigantic Problem of the R.N.A.S.— Struggle for the Belgian Coast—Raiding the German Sub- marine Bases—Airships and Seaplanes—Co-operation with the R.F.C.—The Air War on Germany Begins—Cuxhaven and Friedrichshaven Raids	53
--	----

Contents

CHAPTER V

FROM YPRES TO GIVENCHY

	PAGE
The Value of the Military Observer—The Development of Aerial Combat—The Psychology of the Air—Aircraft in the First Great Battle of Ypres—The Reaction—The Last Tribute of the R.F.C. to Lord Roberts—Development in Military Aviation in General—Moral and Military Results of Air-Raids—The Gurkhas and German Aerial Propaganda—French Aerial Defences	68

CHAPTER VI

OUTPOSTS OF CIVILISATION

The French Rout the Aerial Invader—Curious Effect of Aerial Manœuvres upon those of the Military—The Vivid History of a French Aeroplane in the War—The French Aerial Autumn Campaign outlined in Detail—Through Blizzard and Frost on the Russian Front—The Amazing Story of Prince Joachim—Russian Aircraft before Przemyśl—The German Air Services at Bay—Revelation of the German War Losses in Aircraft—Opening of the Great German Aerial Campaign against Britain	85
--	----

CHAPTER VII

ZEPPELIN WARFARE

Résumé of the History of the Airship—Comparison of Aeroplane and Airship for War Purposes—British Anti-Zeppelin Devices—Schutte-Lanz and Parseval—German Strength in Zeppelins at the Outbreak of Hostilities—Types of Zeppelins—Super-Zeppelins—The German Aerial Invasion—The R.F.C. and Zeppelins—Zeppelins in Naval Warfare	103
---	-----

CHAPTER VIII

THE R.N.A.S. IN ACTION

Co-operation with the Royal Flying Corps—Seaplanes at the Sinking of the <i>Blücher</i> —The Christmas Day Raid on Cuxhaven—The Germans offer £1,000 for Commander Samson, R.N., dead or alive—Düsseldorf—The Strange Story of a British Naval Pilot's Lunch at a German Aerodrome—Bombing the Zeppelin Sheds at Brussels—Flight Sub-Lieutenant R. A. J. Warneford, V.C.—Seaplanes at the Dardanelles—Was the Navy Justified in Loaning so many Aeroplanes to the R.F.C. ?	120
--	-----

Contents

CHAPTER IX

THE CAVALRY OF THE CLOUDS

The Flying-Man, the Paradox of War—Reorganisation of the R.F.C.—“Flying Weather”—Reconnaissance, Strategical and Tactical—Direction of Artillery Fire—Aircraft, at Ypres, save the British Army from Destruction—The Development of the Aerial Duel—Personal Experiences of a Battle Pilot—Destroying the German Lines of Communication—British Air-Raids . . .	139
---	-----

CHAPTER X

LIGHTER-THAN-AIR CRAFT

The Inglorious Earlier History of the British Airship—“Beta,” “Gamma,” “Delta,” “Eta”—Brigadier-General Maitland—Training the British Airship Personnel—The Aeronaut in War—Early French Airship Raids—Italian Semi-Rigids—Kite Balloons in Action—Kite Balloons at the Second Battle of Ypres, April, 1915—The Captive Balloon and the Fleet . . .	157
---	-----

CHAPTER XI

THE FRANCO-GERMAN WAR IN THE AIR (FRANCE)

French Campaign of Reprisals—The German Message from the Skies—Superiority of the French Aviators—The Glorious Death of Senator Reymond—Garros and Pegoud—Organisation of French Aviation Corps—Northern and Southern Spheres of French Aerial Activity—La “Ville Lumière”—The Manner in which a May Aeroplane Raid on Paris was Frustrated—The Death of Lieutenant von Bülow of the Berlin Imperial Guard . . .	173
--	-----

CHAPTER XII

THE FRANCO-GERMAN WAR IN THE AIR (GERMANY)

Gigantic Nature of Germany's Aerial Effort—Precautions against Allied Raids—Psychology of the German Air Command—The “City of Dreadful Night”—German Aeroplane Raids—Experiments in Bomb-Dropping—Zeppelin Spring Campaign—Disasters with the Giant Airships—The Fine Imposed on the City of Brussels—Friedrichshaven—Development and Construction of the Super-Zeppelin—The May Zeppelin Raid on Calais . . .	191
--	-----

Contents

CHAPTER XIII

THE ANGLO-RUSSO-GERMAN AIR WAR

	PAGE
The Story of the Russian Air Service—"Ilya Mourametz"—Russia's Desperate Fight for the Air—The Reason of the Russian Aerial Downfall—Summer's Campaign with the R.F.C.—The Glorious Vindication of Second Battle of Ypres—Development of Aerial Combat—The Genius Battle Airman—Reconnaissance over the Enemy Back Areas—British Aircraft in the Allied Offensive on the Western Front	210

CHAPTER XIV

THE DAY'S WORK

The Airman's Day—Over the Battle Lines—Frozen in Mid-Air— Daring Feats of British Reconnaissance Airmen—Field-Marshal French's Glowing Praise of the R.F.C.—The Renewed Struggle for the Air—British Aviation Casualties—Captain Robert Lorraine's Military Cross—The Sunset Return	227
---	-----

LIST OF PLATES

"DEATH TO THE MURDERERS" <i>From the painting by Gordon Crosby</i>	<i>Frontispiece</i>
A DUEL IN THE AIR	FACING PAGE 10
CURIOUS WAR-TIME ACCIDENTS . . /	28
SAVING THE MECHANIC	50
GERMAN AND RUSSIAN AIRCRAFT TYPES: 1914-1915	72
"ARCHIBALD" SPEAKS	90
IN THE GONDOLAS OF A ZEPPELIN	106
SOME AIR HEROES OF 1914-1915	130
AIR FIGHTING TERMS—ILLUSTRATED	154
KITE BALLOONS WITH THE NAVY	170
R.N.A.S. AIRCRAFT TYPES, AUGUST, 1914	188
JUMPED!	212
CAUSE AND EFFECT	230

FOREWORD

BY BRIGADIER-GENERAL LORD MONTAGU OF BEAULIEU

IN writing this foreword for Mr. Middleton's book, "The Great War in the Air," I do so with special pleasure, as the book contains the history of one of the most wonderful developments of the Great War, and of some of the bravest deeds done in it.

So lacking in foresight were the authorities before the war that the original number of airplanes available for war purposes on August 4, 1914, for service with the Expeditionary Force was only about 36. But small as this number was, owing to the bravery and devotion of the officers in charge of them, these airplanes were probably instrumental in preventing the small British force from being totally encircled by the immense German army which was then advancing very rapidly in Belgium and France. Without wishing to draw any comparisons with the air services of other Allied powers, it is, I think, an unchallengeable fact that the R.A.F., especially after the amalgamation of the naval and military branches, displayed a spirit of audacity in attack which was unequalled. It was this bravery, reckless of odds and risks, which made the R.A.F. so greatly feared by the enemy.

Foreword

During the war the size and the influence on the war of the R.A.F. grew until, in my opinion, in November, 1918, it had become the most formidable single factor in the fighting on the Western Front. What would have happened had the war endured until the summer of 1919 no one can say, but I feel convinced that the Air Force would have further distinguished itself, and that the bombing of Germany on a large scale would have taken place, resulting in the paralysis of ordinary life in the towns and in the almost total interruption of the chief German lines of communication.

In future wars air power will be of increasing importance. It may be even of such importance that other arms may be largely subsidiary or auxiliary to air operations. Just as air has no confines except extreme altitude above and the earth beneath, so in the next great war air power will defy distance, and be able to strike, irrespective of sea or land or of navies and armies, at a distance possibly of one or two thousand miles from its base, and the effects of air power will be so destructive that the morale of any civilised nation attacked with its humanity concentrated in towns will crumble away with extraordinary rapidity.

I feel convinced that in the future the maintenance of air power will be even more important to the British Empire than the maintenance of sea power has been in the past. It will be too late, however, on the eve of a suddenly declared war like the war of 1914 to try to improvise hasty arrangements which should have

Foreword

been made during peace preceding the outbreak of hostilities. Even if a large official air force cannot be maintained in these days when the need for economy is vital, we must see to it that civil aviation receives every support and encouragement in order that pilots and planes may be available when the need arises for the re-creation of air power on a large scale.

Great Britain has been the mistress of the seas in the past, she must be mistress of the skies in the future.

Warrant of Recognition

Sept. 1949

THE GREAT WAR IN THE AIR

CHAPTER I

THE ADVENT OF THE FOURTH WING

A German Air-Raid—Cause and Effect—Mustering of the Forces—A Brief Glimpse into the History of Aviation—Comparison of Aerial Powers on the Outbreak of Hostilities—Germany's Extensive Preparations for Aerial Warfare.

"THE biggest air raid of the whole war was carried out by the Germans against Dunkirk yesterday." So, modestly hidden away in a corner of a daily newspaper, almost overlooked, was first announced to the world the greatest event in the amazing history of aviation. Dwarfed to insignificance by the crowded events of the great world war, it was yet to hold pride of place on the long, steep road of military aviation. From this day—January 13, 1915—developed the great transition of military aviation from a mere defensive weapon to an aggressive unit of the military machine, scientifically developed and enormously expanded, that was, ultimately, to play the most vital part in bringing Germany to her knees. Though the war was yet young, previous air raids had occurred by the score, British and German, French and Russian; raids on England and raids on Germany, but no one organised as this. Said the newspaper correspondent: "It was a host." Also, it was the first air raid to be carried out with a definite military objective.

German agents—and through no country in the world was the enemy espionage system better organised in the war than in Belgium—had passed word by way of the customary secret channels that President Poincaré intended visiting Dunkirk that day to present a flag to the famous French Marine Fusiliers. But Providence and the sharp wits of the French Intelligence

The Great War in the Air

were to thwart their deep laid schemes; the visit was postponed for a day. For once at fault in their information, the German airmen swarmed over, and for four and a half hours unmercifully bombed the town that was later to earn the unhappy *nom de guerre* of "the city of dreadful night." Early on a cloudless morning the vanguard of the enemy squadron swept into view against the unclouded eastern sky-line; returning again and again from that hour until well after three in the afternoon.

Bombs for Poincaré

"The tocsin sounded first from the high tower of Dunkirk church at 11 A.M.," runs the newspaper account, "and the blue and white flag of the town was run up on the staff. Then a solitary biplane appeared from the east. It was the scout in advance of the main body of the squadron. In spite of the warning bell people gathered in the main square of the town and the side streets to look at the gleaming aircraft overhead. Only a few minutes passed, however, before the tocsin rang again, and this time five German aeroplanes swam into sight in the clear sky. One aeroplane came from the north, from the sea, the four others from the east. All five were together over the central square of Dunkirk at a height of only 3,000 feet. Meanwhile the guns of the forts were ranging on them with shrapnel, and all round the German flyers the white puffs were bursting. One of the biplanes turned back, and as the sun glinted on the steel sides the few people who had not taken shelter in their cellars raised a cheer, for they thought it was on fire. However, more and more of the airmen came, while the first went on to drop their bombs on Dunkirk's suburbs—Malo, Coudekerque, Rosendaël, and St. Pol.

"In all fifty bombs were dropped, some explosive and some incendiary. In Malo five people were killed; in Dunkirk one.

"At St. Pol several people also were killed. It is even said that four were killed at Adinkerke, six miles away.

"Two of the raiders were brought down by gunfire, one near the flying-ground outside Dunkirk, and another on its way home, at Wulpen, which is twenty miles away towards the German lines, to the north of Furnes. One French machine

The Advent of the Fourth Wing

went up against the host, but six of them immediately set themselves to surround it, and it had to come down."

It is interesting to note that at the end of their day's bomb-dropping the German airmen threw down weighted streamers on to the town which bore the words "Bonjour, Poincaré; à demain."

The War Balloons of 1797

In the light of later and more war-wise eyes, the correspondent would appear to have made a veritable mountain out of the molehill of yet undeveloped aerial warfare. But, for every purpose of a history of the war in the air, the incident stands out like a beacon. It is the connecting link between the shadow stories of mythology, of Phryxus and Helle, Xerxes, Cyrano de Bergerac, the silk-coat parachute of the elder Joseph Montgolfier, the later sail balloon of Blanchard, and aviation as we now know it. The always amusing, often incorrect details of aviation in the Middle Ages; the punitive war in the air prophesied by the "comfortable" Doctor Johnson in his paradoxical remark, "But what would be the security of the good if the bad could at pleasure invade them from the skies?" the quaint and original ruling of the Austrians in their war against the French in 1794; a threat to shoot as spies all enemy aeronauts brought down in their territory, and the derogatory 1797 letter of General Hoche to von Wetzler, the Minister of War, concerning his unwanted balloon detachment: "Citoyen Ministre, I beg to inform you that the army on the Sambre and Meuse has a company of balloonists, for which it can find no use; perhaps it would be better to let it join the seventeenth military division, where it would be nearer the capital, and so in a better position to do more useful work," carry the imagination at a bound to the sterner realities of the birth of practical aviation and aeronautics; of the long and desperate struggle of the aged and indomitable Count Zeppelin in the development of his giant airship, and the tardy, cynical reception by the world of the aerial wizardry of the brothers Wright. And, again, every event bridging a century, the imagination is carried on abruptly, like witnessing the tabloid life-drama of a "movie" picture, to the advent of aircraft in the great war;

The Great War in the Air

brought to a vivid climax with the German aeroplane raid on Dunkirk.

Vanished for all time was the popular fetish of aviation being but a sport for idle young men. Stripped of their popular halo of dare-devilry, flying men and machines disappeared silently and mysteriously into the haze of the war horizon, to face the greater spectacle of war; and to prove, for all time, the vital importance of the eyes of the army to the blind hosts on the surface of the earth beneath.

The Mustering of the Forces

Aircraft have been brought into prominence as sinister engines of destruction; one year of war developed aviation a decade further than it would have gone under normal peace conditions. The cavalry, disgustedly digging trenches and filling sandbags, found their métier suddenly transferred to the Pegasus of the skies, who, with treble the speed and in a third less time, could achieve better and more accurate reports of the enemy dispositions. Surprise was completely eliminated from war. Though aeroplane observers failed to warn the army commanders in time of the four new German formations advancing on Menin, and Hindenburg was left totally unaware of the Russian trans-Vistula movement that threw his armies back from Warsaw, in the West it was the splendid reconnaissance work of the British R.F.C. that saved the Allied armies from being driven back into the sea—whereof General Joffre was moved to write of the Flying Corps: "The precision, exactitude, and regularity of the news brought in by its members are evidence of their perfect organisation and also of the perfect training of pilots and observers." The enemy, by way of the air, received the first news of the British encircling movement from the Aisne. And, similarly, British airmen again stepped into the breach in the long struggle between Arras and Nieuport; never a day failing to keep track of the German reinforcements and indicating the weak spots in our own lines.

At the date of the Dunkirk raid occasional gleams of intelligence of the work of the British airmen in holding off the German onslaught on Calais and the French capital through

The Advent of the Fourth Wing

the long, tense vigil of autumn, 1914, were already finding their way past the eagle eye of the Whitehall censor. But the true story of the trial and anxiety of those few months was never told; how, time and again, pilots, after an arduous day's work in the air, would have perforce to turn to and work all night, transferring their base some twenty miles to the rear of the fighting lines; how, on broken and decrepit machines that could barely stagger across the lines, lives were daily gambled within easy range of the enemy anti-aircraft guns, waiting hopelessly for the reinforcements that never materialised. Stilted, incoherent narratives were those official reports. And they were alarmingly vague. Now, they would emanate from away up at Dunkirk; now, from some unknown village or hamlet far down in the south, but ever creeping backward and eastward with a persistence that was ominous. In fact, the only satisfaction they offered was that the gallant R.F.C. had proven itself in war; and that outgunned, gravely handicapped against superior craft and numbers, the reconnaissance machines were achieving, literally, miracles in the way of reports, and more than holding their own against the splendidly equipped German Air Service.

Sir John French and the R.F.C.

The precise nature of the aerial work carried out at this period—the Retreat had already been fought to a glorious standstill; the Germans made their first murderous onslaught upon Ypres: and Givenchy, a battle of the past—in the words of Sir John French's fifth dispatch, published February 2, 1915, was: "In addition to the daily and constant work of reconnaissance and co-operation with the artillery, a number of aerial combats had been fought, raids carried out, detrainments harassed, parks and petrol depots bombed.

"Various successful bomb-dropping raids had been carried out, usually against the enemy's aircraft material. The principle of attacking hostile aircraft whenever and wherever seen (unless highly important information was being delivered) had been adhered to, and had resulted in the moral fact that enemy machines invariably beat immediate retreat when chased.

"Five German aeroplanes were known to have been brought

The Great War in the Air

to the ground, and it would appear probable that others, though they had managed to reach their own lines, had done so in a considerably damaged condition."

Interesting as is this publicly expressed opinion of the Commander-in-Chief, yet more interesting is the view of an impartial observer, who treats of the manner in which Sir John employed this new and splendid arm of his war services. Says this witness: "He"—Sir John French—"relied on entirely second- or third-hand evidence of things seen or heard by others over a front of many miles, and communicated back by the agency of electricity or petrol. Messages sent in by telegraph, wireless, telephones, motor-cars, and aeroplanes were the daily food of the General Staff, for the handling of this mass of material collected by others, its analysis and its application to the situation for the purpose of framing plans, were their work."

It was this same "Eye-Witness" who was recorder-in-chief to the R.F.C. at this time, in their work along the front of hundreds of miles. Occasionally, but not often—for it was by now war in its sternest reality, and any information is information for the sharp ears of the enemy—he lifts the veil of the battlefield along the Flanders skies. At one time, "Here in this neighbourhood," he writes, "are to be found the first visible signs that fighting is going on. Yet, though the area from here onwards contains thousands of troops, all cavalry, artillery, and infantry will alike be so hidden in villages, in woods, or in folds of the ground that there will be no trace of them in the landscape. This is one result of the all-pervading and all-seeing aeroplane." An outspoken testimony. And again: "On one occasion our machine chased a Taube, and having attained the favourable position for shooting, the observer emptied his automatic pistol"—a fact significant in itself—"at the enemy, without any visible result, at about 150 feet range. He then proceeded to take a photograph, and the appearance of the camera seems to have alarmed the German aviator, who at once fled. Upon another occasion a somewhat difficult situation arose when a bomb, which was being dropped, caught in a string and remained suspended three or four feet below the aeroplane. There was no way of reaching the bomb, and it was impossible to land. Finally the observer

The Advent of the Fourth Wing

kicked a hole through the floor of the fuselage, hooked the string with his foot, and shook it until the bomb fell off."

These are but a few of many everyday and unvarnished incidents of the daring work of the British airmen in the war, that were later to thrill and astonish the whole world; but they present a curious paradox in psychology. The German aviator, specially trained in reconnaissance and the direction of artillery fire; and in the words of General von Hoppner, the C.-in-C. of the German Air Service, "considering every flight as a military act," was to prove far from brilliant in his airmanship. The French airman, brilliant and daring, was apt to be erratic when handling a war machine. But the British pilot, of them all, was more at home in the air; even receiving grudging praise from von Hoppner, who admitted: "The English show in air fights that they are of the Germanic race (*sic*), for they seek fight, and fight until either they or their opponents are killed . . . for the British flying is but sport, but, when it comes to a fight, good sport."

Flying before the War

This fact in itself is significant. Sport or not, the English, last in the air, were to prove themselves masters of the air, as von Hoppner was to find to his cost. At the first great aviation meeting at Rheims no British pilot or machine competed. The eyes of the whole world were eagerly focused upon Rheims that day, but no solitary Englishman was there to demonstrate British aviational capabilities. Despite the big lessons of this meeting the British Government continued to ignore flying. Every nation by this time was alive to the possibilities of the air, and events were beginning to shape themselves into the last supreme effort of war; but, throughout, Englishmen were to figure insignificantly therein.

With the year 1900, the Wright brothers had built their first glider, and in 1903 made their first flight with a motor-driven plane. By 1906 Santos Dumont had won the first flying prize. In 1908 Henri Farman won the Grand Prix with his Voisin biplane, and Wilbur Wright commenced flying in France. Three years later Cody began to make successful flights with

The Great War in the Air

the British Army biplane; while Bleriot flew the Channel on Sunday, July 25. In this year (August) the first Gordon-Bennett race took place at Rheims, and the first British Aviation Meeting—three years late—at Blackpool. In 1910 the London-Manchester flight was won by Paulhan—a Frenchman. The circuit of Britain, in 1911, was carried off by another Frenchman, Lieutenant Conneau. But not until 1912 did the British Flying Corps come into existence.

Towards the end of 1911 the first practical school of aeronautical engineering was established in Great Britain. Lieutenant—after Commander—C. R. Samson, R.N., made the first flight from a British battleship early in 1912. In January of the same year M. Vedrines, on a monoplane, made a speed of 92 miles per hour; and M. Taboteau, also on a monoplane, covered 128 miles in two hours. While at the first Gordon-Bennett Meeting, in 1909, the Aviation Cup was won by Glenn-Curtiss (America) at an average speed of 47 miles per hour, in 1910, when it was raced for at New York, it was won by Grahame-White at a speed of 62 miles per hour. In 1911 Weymann won it at Eastchurch, Isle of Sheppey, at 78 miles per hour; and in 1912 Vedrines won it at Chicago at 105 miles per hour. In January, 1914, M. Pourpe flew from Cairo to Khartoum, the aviator Garros, without a stop, traversed the whole breadth of the Mediterranean, from France to Bizerta, and Jules Vedrines, starting from Nancy, covered the whole of Germany at a bound, and in eight successive flights reached Cairo by way of Constantinople, Asia Minor, and Palestine, thus emulating Brindejonc des Moulins, who earlier covered a 3,000 miles journey extending to Berlin, Petrograd, Stockholm, Copenhagen, and back to Paris. But it was the Rheims meeting, already detailed, that was the preliminary tourney-ground of the aerial Great Powers of the world.

A Comparison of Belligerent Aerial Forces

In some cases, consciously, in others, subconsciously, the nations were preparing for the Armageddon inevitable. Twenty thousand pounds was voted by the Belgian Government in 1913 for the construction of aeroplanes and the necessary hangars and aerodromes. At the outbreak of hostilities

The Advent of the Fourth Wing

Belgium was in possession of some thirty serviceable craft, though it is doubtful if fifty per cent. of these machines were ready to take the air at the time of the German invasion. The aeroplanes were all French types, mostly Farman "pusher" biplanes, fitted with 80-h.p. Gnome engines. Later, when the majority of the machines of this preliminary squadron had been rendered useless by the strenuous conditions of the early days of the war, the French made good the deficiency; this time with some of their latest and most up-to-date planes, as Nieuports and Moranes. Operating from Furnes—south-west of Ostend—the Belgian airmen fulfilled two invaluable military purposes. Covering the right flank of the advancing German Army, they kept the Allied commanders constantly supplied with information concerning the strength and disposition of the German forces, and, co-operating with the British and French sister services, they carried out innumerable raids upon enemy positions in the neighbourhood of Ostend.

Russia a First-Class Air Power

Russia, playing a lone hand for the Allies, far away in the east, had not only made rapid strides with her aircraft, but stood already in the foremost rank of aerial powers. Perseverance and practical application of science were the secrets of her success. When war broke out Russia had at her disposal about 300 highly trained military pilots, about 100 naval pilots, and more than 200 civilian pilots, whilst a large number of officers were in course of training at the various schools. This excellent state of affairs was the result of State subsidies, in the shape of big financial grants. Even the Germans were surprised at the extent of Russia's aerial resources, and Great Britain had no idea whatever of the progress made by her new Ally.

In this history of Russian aerial development three names stand out above all others. First is the Grand Duke Nicholas, afterwards to become the Commander-in-Chief of all the Russian armies, a man of great imagination and unusual foresight, who had, long before the war, determined that Russia should possess a strong and efficient air service. For this purpose, he looked around for talented designers, and secured

The Great War in the Air

the services of the famous Sikorsky, and a less celebrated Scotchman named Chessborough Mackenzie-Kennedy. At the early age of twenty Mackenzie-Kennedy had already attained considerable prominence in the world of aerial design. He soon caught the eye of the Grand Duke, and was ordered, with Sikorsky, to construct the first Russian war aeroplane. Thus, at the immature age of eight-and-twenty, a stranger in a strange land, he became the presiding genius in aeronautical construction. The two men became the closest of friends, and their joint efforts furnished over a score of different types of aircraft, from the "Sikorsky" giant biplane to the baby monoplane.

If Russia had made headway with development, even more so had France, who, according to *The Times History of the War*, took the field with between 500 and 600 effective aeroplanes, a good auxiliary equipment, and a trained personnel. She had a number of airships, serviceable enough in their way, but hopelessly outclassed by the German ships. Her naval air service was hardly worth consideration, although the few machines in use were the best of their types. The bulk of the French aeroplanes on the outbreak of war were Farmans, the others representing specimen products from most of the successful French factories. Unfortunately many of these were experimental and no facilities existed for their construction in quantity. Trouble arose also through the lack of interchangeability, so that many machines were soon out of service while they waited for the provision of some simple spare part. The history of the growth and development of the French air service during the first three years of war was akin to that of the British. The Government took over the work of supply, and many hundreds of big and small concerns were set to work to fill the gaps.

Germany's Careful Preparation

The bulk of the French aeroplanes were first engaged on the eastern frontier, and their doings received little publicity, either in France or elsewhere. Soon the French frankly admitted that they had underestimated the German pilots, whom they had regarded as of the purely mechanical type, devoid of dash or

The Advent of the Fourth Wing

brilliance. In this they were not altogether wrong, but the Germans knew exactly what their aeroplanes could do, and their airmen had received very definite instructions regarding their handling of the machines. Also, types had been standardised to avoid delay in making losses good; they had big reserves of pilots and observers trained and in training, together with a sufficient mechanical equipment and personnel; probable losses had been estimated and allowed for; and, more important than anything else, the Germans had a clearly defined plan of campaign. In consequence German pilots refused to be driven from the air by the audacity of the French airmen, and their stolid mentality sent them steadily on with the prearranged plan, until the French grasped the fact that, if the enemy was to be beaten in the air, it could only be by aeroplanes superior in design and number. Had the original German scheme for a short, smashing campaign gone through, their air equipment was ample for the purpose. It was simply prolongation of the war that gave both the Western Allies time to create strong aerial fleets.

Why the German Plan Failed

German military opinion went astray in thinking that aircraft would make the strategy of previous wars impossible, for it argued that, by exposing the plans and dispositions of the enemy commanders, overwhelming numbers could be thrust through the weakest places, leading to quick and crushing defeat before the defending forces could rally for the attack. The vital factor in a plan conceived along these lines is absolute mastery of the air, which alone can give the attacking force a knowledge of the defences to be overcome, while keeping the enemy in complete ignorance of how and when and where the thrust is to be made. The German armies invading France had not mastery in the air, but merely superiority, and here the plan failed, for, warned by their own aircraft of the German dispositions, the French were able to concentrate on the threatened areas, holding the invaders up until the defence was organised.

Meanwhile, a rough comparison of the number of effective aircraft available at the outbreak of hostilities shows :

The Great War in the Air

Nation		Aeroplanes	Pilots	Airships	
				First class	Second
Great Britain	...	130	80	4	2
France	...	500-600	700	4	10
Russia	...	500	600	4	3
Belgium	...	30	50	—	—
Austria	...	120	200	1	1
Germany	...	700	1000	18	6

The airship comparison takes into account the relative speeds and powers of duration; the aeroplane aggregates are those available, not effective.

With these figures before one, it must always remain one of those unsolvable mysteries of war, why, as *The Times* historian remarks, "Germany had not the mastery of the air." Never was a nation better prepared. No one of the Allied air forces had anticipated, far from made preparations for, the intricate mass of aviational adjuncts that the German, with his national sense of thoroughness, and eye to detail, had fostered and developed to a fine art. No detail was too insignificant to be included in that intensive plan of aerial campaign. No item, however remote, that would promote in any way at all the efficiency of Germany's service in the air was allowed to be overlooked. It leaves the student astounded that so much time and patience, energy, and determination, should have all been devoted to an object that was afterwards, like a two-edged sword, to cut into the hands of the skilful artisan who had fashioned it.

It was no eleventh-hour hazard at the mastery of the air, this; but one conceived item by item, in cold blood, during the last decade of the forty years' preparation. Though ostensibly pinning her faith to Zeppelin's giant airships, Germany did not neglect to build up a great fleet of aeroplanes. While openly scoffing at the first aerial attempt of Pau and Rheims, Orville Wright had been secretly engaged to instruct a highly placed German staff-officer in the art of flying, at Potsdam. A wholesome fear of aerial developments in the border State of France brought Germany to this decision. In a Note regarding "The Strengthening of the German Army," dated Berlin,

The Advent of the Fourth Wing

March 19, 1913, that was forwarded to M. Etienne, Minister of War, by a French secret service agent in Berlin, the German authorities admitted that—at the time of the famous Agadir incident—"The progress of the French Army, the moral recovery of the nation, the technical advantage gained in the field of aviation, made an attack against the French less easy than in a previous period." No further time was lost. Aviators of all nationalities were invited into Germany to undertake the instruction of the many hundreds of army officers who were learning to fly. Aeroplane factories and engineering works sprung up, literally over-night, from one end of Germany to another. And directly a new type of aeroplane or engine made its appearance the manufacturers were approached, with a view to purchase, by some agent of the Imperial Government. One month previous to the outbreak of hostilities, a large group of German and Austrian staff-officers paid a "friendly" visit to the British R.F.C. headquarters at Netheravon.

Early German Bombing Raids

"If the Germans have sprung a surprise on us in the way of heavy guns, they have certainly also done something similar with their aeroplane service," a *Morning Post* correspondent, writing on November 3, 1914, was forced to admit in the face of the early German overmastering superiority, "for the activity of these aerial scouts all along the line is simply incredible. All over this Somme department there are daily visits of these pests, sometimes singly and sometimes several at a time. But they are not as expert bomb-throwers as our aviators, and their efforts in this direction leave the populace quite unmoved. As scouts, however, they seem to do good work in giving their range to their gunners, judging by the results of their visits, in the shape of greater precision in the arrival of their shells. In this department, as unfortunately in others, such as the transport of their big guns, the exceptionally fine weather we are enjoying this autumn is in favour of the Germans."

The German aerial scheme of war was built up with the precision and the exactitude of the foundations of some giant building. The enemy's motto appeared to be, "The actual

The Great War in the Air

fighting in the air is won by the hand and the head behind the machine"; by the strategic foresight and organisation capabilities of the commanders on the surface. With an eye to aviational bases that could afford, at one time, protection to the Fatherland from raiding enemy aircraft; strike with economy of effort and immediate speed at the heart of France and Russia, respectively; and offer a safe and commodious retreat to her own night-flying bombers, Germany laid down all her principal aerodromes and airship bases along the western and eastern frontiers. In fact, she was more powerfully fortified along her aerial frontiers than all the strength of Britain's coast defences from Plymouth Hoe to Scapa Flow. In all, there were 53 such stations; 33 airship bases, and 20 aerodromes. The airship bases were laid down in the following order and localities:

1900-1908 (Total number, 4).

Bitterfeld (2 sheds). Friedrichshaven. Mazell.
Tegel (4 sheds).

1909 (Total number, 9).

Cologne. Berlin (Biesdorf). Leichlingen. Metz.
Mannheim (Rheinan).

1910-1913 (Total number, 19).

Düsseldorf. Gotha. Berlin (Johannisthal) (2 sheds).
Frankfurt. Hamburg (Fuhlsbüttel). Königsberg.
Potsdam. Liegnitz. Thom. Wanne.

1914 (Total number, 31).

Aachen. Allenstein. Cöln-Nipper. Dresden. Graudenz. Hanover. Heligoland. Lahr. Leipzig. Posen.
Scheidemühl. Treves (Trier).

Outbreak of Hostilities (Total number, 33).

Brunswick and Cuxhaven.

The aeroplane bases were situated, on the west, at Münster, Gelsenkirchen, Frankfurt, Mainz, Speyer, Saarberg—after-

The Advent of the Fourth Wing

wards to figure prominently in the reports of the night-bombing raids of the Independent Force, R.A.F.—Stuttgart, Freiburg, and Manzell (Lake Constance); all down the Rhine. Along the seaboard of the North and Baltic seas air bases were established at Hamburg, Flensburg, Neumunster, Schwerin, Warnemunde; and along the eastern frontier at Elbing, Scheidemuhl, Posen, Glogau, Breslau, and Liebau; thus offering a pretty determined aerial front on all sides of the German Empire. All these stations were equally equipped for night and day flying.

Their lighting arrangements for night-flying aeroplanes were particularly excellent. The most favourable of these night-lighting schemes was a large white light placed in the centre of the landing-ground and sunk into a trench in the earth, that was covered with thick glass to withstand the weight of an aeroplane. At a distance of about 250 feet from this light, and also sunk into the ground, were four red lights corresponding to the cardinal points of the compass. Each of the red lights was connected by subterranean cables to a wind-vane, mounted on a mast or tower at some convenient point. At night the central light glowed constantly, while the red light in the direction of the wind indicated to the pilot the wind conditions where the landing was to be made.

Germany's Night Flying Arrangements

For two years previous to the war German aerial experts had experimented with these lights, sparing neither time nor money in the attempt. The success that attended these long and strenuous efforts may be judged by the extensive lighting system that was operating in Germany at the outbreak of war. According to *L'Aerophile*, the complete system was as follows: "Belgern-on-the-Elbe, in Prussian Saxony: revolving electric light flashing once in every 1.5 seconds, 72 metres above ground, 7,000 candle-power; gives warning of high-tension cables, in course of construction. (2) Bernkastel-Kues: revolving electric light giving two flashes, 425 metres above sea-level, 250,000 candle-power; shows where aerodrome is. (3) Bonn: fixed electric light with circular disk of stepped prisms, 8,500 candle-power; gives by series of flashes the number of the station.

15

15

The Great War in the Air

(4) Doberitz: revolving acetylene light flashing every three seconds, 27,000 candle-power; belongs to the military aerodrome. (5) Kaditz, near Dresden: revolving electric light with two flashes in nine seconds, 250,000 candle-power; shows the aerodrome at Kaditz. (6) Eilvese, near Neustadt, in Hanover: wireless station; revolving electric light flashing every four seconds, 300,000 candle-power; indicates the tower of the T.S.F. station. (7) Gotha: fixed electric light with Fresnel lens, 30,000 candle-power; indicates by flashes the number of the station; belongs to the Gotha Aeroplane Manufacturing Company. (8) Grosser Feldberg, in the Taunus mountains; fixed electric light, 800,000 candle-power. (9) Johannisthal, near Berlin: fixed electric light with Fresnel lens, 30,000 candle-power; indicates by flashes the number of the station; only used when required. (10) Königsberg: fixed acetylene flash light with Fresnel lens, 1,300 candle-power; belongs to the military authorities, and indicates the shed for dirigibles. (11) Liegnitz: fixed electric light with Fresnel lens, 8,500 candle-power; flashes give the number of the station; belongs to the military authorities, and indicates the shed for dirigibles. (12) Lindenberg, near Berlin: Morse beacon of nine lamps with metal filaments, having together 3,600 candle-power; gives by flashes the letter L, at the Lindenberg Meteorological Observatory. (13) Metz: fixed acetylene flash light, fitted with Fresnel lens, 1,200 candle-power; belongs to the military, and indicates the dirigible shed. (14) Nauen: wireless station: Morse beacon, with filament lamp of 1,000 candle-power; gives letter N in flashes; shows large tower of the T.S.F. (15) Posen: fixed acetylene flash light, fitted with Fresnel lens; belongs to the military authorities, and is on the field of manœuvres. (16) Posen: fixed electric light, fitted with Fresnel lens, 8,500 candle-power; belongs to the military authorities. (17) Berlin, at Reinickendorf: fixed electric flash light, Fresnel lens, 1,200 horse-power; belongs to the military authorities. (18) Schleisheim, near Munich: 2,500 candle-power; belongs to the military authorities. (19) Strasburg: fixed acetylene light, Fresnel lens, 2,500 candle-power; flashes give number of the station; at the aerodrome, and belongs to the military authorities. (20) Tegel, near Berlin: revolving acetylene flash light, 2,000 candle-

The Advent of the Fourth Wing

power; belongs to the Second Battalion of the Aviation Corps. (21) Weimar: revolving electric flash light, 10 metres above the aerodrome, 27,200,000 candle-power; belongs to the Aviation Society of Weimar."

Germany was to carry out more aerial night work than any other of the belligerent Powers; raids on British shores, on military depots behind the British front in Flanders, and on French and Russian towns and fortifications. It was Germany that first instituted night flying in war, not alone for the object of bomb-raiding, but even for a sort of reconnaissance—spotting the flashes, and thus locating the positions of the Allied heavy artillery after dark. Hence the foresight of this somewhat extensive lighting system cannot be over-estimated.

Great foresight, as has been stated, marked every branch of the enemy aerial preparations. Financially interested in numerous aircraft construction and engine firms for many years, the German Government took over every firm in the country on the day of the outbreak of hostilities. Their plan of an organised supply of machines was simple to a degree.

A certain type of each class of aeroplane—battle-plane, reconnaissance and bombing machine—was standardised. The entire aircraft industry of the country was concentrated upon the construction of these particular planes, also innumerable sets of spare parts. In turn, these latter were distributed to a series of repair shops along each front, at intervals of a few hundred miles, and, later, at every twenty miles. Thus, every German plane that came in injured from the battle could be repaired on the spot, instead of being transported several hundred miles across country to the factories of the manufacturers—a great economy in time alone.

In December, 1914, the enemy possessed, roughly, some 34 different types of serviceable aeroplanes. And most all of them were fitted with the famous German Mercedes engine; a 6-cylinder, vertical engine, that gave from 100 to 125 horsepower, and an average speed of 75 miles per hour. Perhaps the better known of the German war planes, at least in military and aviaional circles, was the "general purpose" machine, fitted

The Great War in the Air

with 128 h.p. Mercedes engine. The other principal types were :

Machine.	Type.	Seating.	Duration Hours.	Speed. m.p.h.	Radius. Miles.	Engine.
Sommer . . .	Tractor biplane	2	4	70	140	Gnome.
Union . . .	—	2	5	68	170	Austro-Daimler
A.E.G. . . .	—	2	—	62	—	—
Aviatik . . .	—	—	—	—	—	—
D.F.W. . . .	Taube	2	4	68	136	Mercedes.
D.F.W. . . .	Tractor biplane	2	4	65	130	—
D.F.W. . . .	Crescent wings	2	4	74	148	—
D.F.W. . . .	Arrow type	2	6	85	255	Austro-Daimler.
Etrich . . .	Taube	2	4	59	118	Argus.
Fokker . . .	Monoplane	2	4	71	142	—
Goedecker . .	Taube	2	4	60	120	Mercedes.
Gotha . . .	—	2	—	62	—	Argus.
Gotha . . .	—	2	—	74	—	Mercedes.
Halberstadt .	—	2	4	92	184	—
Hansa . . .	—	—	—	72	—	—
Jatho . . .	Steel Taube	—	7	78	273	—
Kondor . . .	Taube	—	—	62	—	Argus.
L.F.G. . . .	Tractor biplane	—	—	—	—	—
Roland (L.F.G.)	—	—	5	—	155	Mercedes.
Otto . . .	Pusher biplane	—	—	68	—	Argus.
Schwade . . .	—	—	4	60	120	Stahlhertz.
Age . . .	Tractor biplane	—	—	68	136	Argus.
Age . . .	Racing monoplane	1	—	84	—	—
Rumpler . . .	Tractor biplane	2	—	—	—	Stahlhertz.

CHAPTER II

THE ROYAL FLYING CORPS

Inception—Aircraft Construction in Great Britain—At the War—Attitude of the British Public—In the Retreat—Reconnaissance—The Direction of Artillery Fire—Bomb-Raiding—First Raid on the Rhine Airship Sheds.

THOUGH officially the British Royal Flying Corps was established in 1912, it was not until the Central Flying School was set up at Netheravon, in the midst of Salisbury Plain, and under the command of Major (now Major-General Sir Hugh) Trenchard, that British military flying assumed anything like a practical basis. Netheravon was the "alma mater" of the modern R.A.F. Almost every British air leader of any standing was trained there, or passed through one of the numerous courses of instruction there held. Every pilot of the early days completed his education at C.F.S., as it was popularly known in the Service. But, at this time, it was no more than an apology of an aerodrome compared with the present-day, splendidly equipped establishment at Cranwell (Lincs).

With the idea of employing Netheravon solely as a temporary base at which aerial squadrons from all parts of the British Isles could concentrate annually for the Army manœuvres—to acquire experience in working with the troops in the field—the authorities ordained that the station should be equipped with portable hangars only, to house machines for this purpose. Every year numerous infantry and artillery officers were detailed to take advantage of the occasion for a careful study of the use of aeroplanes in war—an education that was to prove invaluable in the subsequent outbreak of hostilities. A very fair estimate of the work carried out at this yearly mobilisation may be gathered by reference to a War Office communiqué that was issued in 1914 before the war. "During the week," ran this official dossier, describing the average

The Great War in the Air

routine, "No. 2 Squadron, with aircraft, mechanical transport and personnel, proceeded to Northampton from Lincoln, thence to Oxford. They all arrived at Netheravon on the 30th. No. 3 Squadron: reconnaissance flights were made daily. No. 4 Squadron: the pilots were out practising observation every day. H.Q. Flight: during the week this unit was engaged in experimental work—a co-ordinated programme of progressive training has been drawn up by the Officer Commanding the Military Wing. The programme includes combined aircraft exercises and reconnaissances, mechanical transport and convoy work, mobilisation practice, and lectures and conferences on military and technical subjects."

The Men who Made the R.F.C.

To have achieved even this stage of efficiency Britain was indebted to the untiring efforts and unselfish devotion of a small band of enthusiasts, all of whom were to find fame—and reward—in the Great War. Primarily, Lieutenant-General Sir David Henderson may be said to have been responsible for the fact that, at the outbreak of hostilities, Great Britain was able to place in the field 100 serviceable machines and 66 thoroughly trained pilots and observers. Though the latter, to a large extent, fell to the credit of Major-General Sir Hugh Trenchard, as commandant at C.F.S. With these two may be associated the names of Major-General Sir F. Sykes (then Lieutenant-Colonel, Commandant Royal Flying Corps—Military Wing) and Brigadier (then Captain) E. M. Maitland, who was primarily responsible for building up Britain's now gigantic fleet of airships and kite-balloons; it may be said, in face of not inconsiderable opposition. If the Government proved dilatory regarding this latest branch of the Service, as may be judged by the fact that, at a dinner held in London, June 6, 1913, to celebrate the anniversary of the inception of the R.F.C., the personnel was not sufficient to fill one small ante-room, these stalwarts, at least, persevered. "The past year has been one of great interest," declared Major-General Sykes, in the course of a paper read before the British Aeronautical Society on February 4, 1914. "Safety, speed, strength, weight-carrying powers, climbing and all-round

The Royal Flying Corps

efficiency have progressed. The burden of our poor General Brown-Jones has indirectly been lightened. But directly, though the height record now stands at over 20,000 feet, the strategic problem of broken roads, railways and bridges remains unaffected. Though an endurance record of over 13,000 miles in 39 consecutive days was carried out last year (by aeroplanes belonging to the British Army), weary, hungry, pack-carrying infantry are not materially assisted in their efforts to footslog an inch farther through heavy mud or dust. . . . The strain on generals and staff is as much as it was. Even the most brilliant gyrations of 'loopers' leave General Brown-Jones cold when grappling with how to beat the enemy."

The R.F.C. already contained two wings; the one naval, the other military. Each wing was divided into squadrons of 24 aeroplanes and 24 pilots apiece, with a squadron-commander at the head; and was subdivided again into flights, comprising four machines and four aviators, under a flight-commander. The squadron was a self-contained unit, having its own transport in the shape of motor-lorries calculated to maintain on good roads a speed of 20 miles an hour. Armed motor-cars were also attached thereto. However, the flying men, unfortunately, had no authority in all the essential matters of financial grants and aerial construction. Hence, according to *The Times History of the War*: "The British Government had strangely failed to realise the importance of strengthening and encouraging the experimental work in the production of engines suitable for aircraft, which was carried out in this country entirely at private cost in the works of individual manufacturers. Before the war broke out, however, the importance of having a supply of suitable British-built engines had been recognised, the War Office had held an engine competition, and a prize of £5,000 was awarded for the engine which best fulfilled requirements.

How Aircraft Production was Developed

"Fortunately for Great Britain and the Allies, a number of aeroplane constructors had survived the lean years before 1914, and these firms, with their own designs for aeroplanes and their manufacturing plants, were of immense value in making up

The Great War in the Air

the leeway when war broke out. The majority were building tractor biplanes of 70 to 80 h.p., having seating accommodation for pilot and observer. When the authorities approved of the private designs offered orders were placed for deliveries in quantities, and when the manufacturing facilities were such as to allow rapid extension additional contracts were placed for building to official designs. The firms who had been experimentally building engines soon found that the small departments in their factories set aside for the work were inadequate, and the aircraft sections began to absorb the whole. Some of the motor-car firms, especially those having body-building departments, were of exceeding value, for they could undertake the construction of aeroplanes throughout. Coach-builders became propeller makers, unholsterers found a dozen different jobs on the new work, and in 1917 there were concerns, possessed of world-wide reputation for their cars, which had not built a vehicle for over two years, but were turning out numbers of completed aeroplanes weekly. In 1914 there were dozens of firms engaged in the making of aircraft parts; in 1915 there were hundreds; in 1917 there were over a thousand; the parts were assembled in central factories. All sorts of people were engaged in aeroplane supply."

British Aircraft in the Retreat

Meanwhile, in Great Britain, with regard to aircraft, the position was far from favourable. In August, 1914, and up to two months after the outbreak of hostilities, Britain was entirely dependent on France for her supply of aeroplane engines. The majority of these engines were air-cooled rotary, averaging approximately 2 lb. per brake horse power. The average weight of the various types was 3-6 lb. per brake horse power; while the 100 brake horse power Renault engine weighed over 6 lb. per brake horse power. The most powerful aeroplane engine in the world was produced before the end of 1916. And in the next three years there was to be considerable progress in the matters of engine construction and design, while lighter, stronger and more suitable metals and alloys were to be produced, and engine life greatly increased, chiefly by improvements in general design and material.

The Royal Flying Corps

The British planes were a somewhat mixed and scrappy lot at the time of the outbreak of hostilities. For the most part they were biplanes. There were a few monoplanes, which were soon to be abandoned for military purposes. They included Martinsyde monoplanes, fitted with 60 h.p. Antoinette motors; 70 h.p. Flanders, having Renault engines; and Deperdussin, Nieuport and Bleriot, fitted with 80 h.p. Gnome engines. The biplanes were Shorts, with 80 h.p. Gnomses, Caudrons, B.E.'s with 70 h.p. Renaults, and Farmans.

Thus equipped, and with 100 machines and 66 pilots, the advance wing of the R.F.C. slipped away one August evening into the haze of the English Channel, disappearing southwards for France, to join the B.E.F.

While the general public at home in England indulged in all manner of wild rumours, doubts and exaggerations as to the fate of those squadrons of the R.F.C. that for three whole weeks disappeared beyond mortal ken, at official headquarters it was a period of grave anxiety.

Faced with the pronounced apathy of the politicians, and often open distrust on the part of certain of the older military leaders, the enthusiastic pioneers of the Air Force awaited eagerly the report of the work of that hardy band of pilots and observers, the report that was to establish flying for all time on the footing of a vital necessity of modern war. Their weary vigil was rewarded. Sir John French's first dispatch, relating to the British movements before Mons, was published on September 7, 1914. Every doubt was set at rest. "I wish particularly," wrote the British Commander-in-Chief, "to bring to your Lordship's notice the admirable work done by the Royal Flying Corps under Sir David Henderson. Their skill, energy and perseverance have been beyond all praise. They have furnished me with the most complete and accurate information, which has been of incalculable value in the conduct of the operations. Fired at constantly both by friend and foe, and not hesitating to fly in every kind of weather, they have remained undaunted throughout.

"Further, by actually fighting in the air, they have succeeded in destroying five of the enemy's machines."

Sir John's commendation was only too well merited.

The Great War in the Air

Certainly, on one occasion, the R.F.C. already had proved instrumental in saving the British Army, if not from annihilation, at least from a defeat of a nature which, with his meagre reinforcements at this time, the British commander could ill have sustained. The aeroplane observers did yeoman service in discovering the real strength of the enemy's concentrated attack before Mons. "When the news of the retirement of the French and the heavy German threatening on my front reached me, I endeavoured to confirm it by aeroplane reconnaissance; and as a result of this I determined to effect a retirement to the Maubeuge position at daybreak on the 24th." Somewhat of a reversal of positions had occurred earlier in the same battle, and once again British airmen had been instrumental in confirming certain secret intelligence furnished by the French headquarters. "From information I received I understood that more than one, or at most two, of the enemy's army corps, with perhaps one cavalry division, were in front of my position; and I was aware of no attempted outflanking movement by the enemy. I was confirmed in this opinion by the fact that my patrols encountered no undue opposition in their reconnoitring operations. The observation of my aeroplanes seemed also to bear out this estimate."

Behind this bald, thin official narrative of aerial reconnaissance lay one of those everyday romances of the Flying Corps that only the strenuous rush of war could have cloaked. It was the story of a British officer pilot who, with his mechanic observer, after being brought down well within the enemy lines, succeeded in making his base again in safety, after all manner of extraordinary adventures. While reconnoitring at only 1,200 feet above the enemy lines, and some fifteen miles from the Allies' front they ran into a murderous burst of enemy anti-aircraft fire. One shell immediately got the engine. The machine dived sharply for the earth. Despite the superhuman efforts of the pilot they were forced to land—some five miles behind the enemy lines. As the Germans were approaching the officer set fire to his machine, and both men hurriedly decamped. But their adventures had only commenced. Hiding in disused houses, sheltering under hedges, missing death a dozen times a day by bare inches; terribly emaciated, they

The Royal Flying Corps

eventually regained the Allied lines. Both men had been wounded in the interval, and the pilot had to carry his companion on his back for many miles.

Spectacular War in the Air

It was such incidents, perhaps, that gave birth in the public mind to the curiously exaggerated hero-worship that they commenced to lavish upon the British airmen, and which the latter were far from appreciating. Somehow the spectacular element of the pioneers of the early days and of the Hendon exhibition pilots was rather accentuated than eliminated in the war. The war in the clouds fired the public imagination, until no story of adventure over the Flanders battlefields, however highly coloured, was too impossible for their beliefs; and no impossible rumour that was not possible to their credence. The air was still too undeveloped, too much confined to the exclusive few, for the layman to view flying in war in its true proportion. And in this matter even so great a master of psychology as Mr. H. G. Wells proved sadly at fault. Suggesting that for every airman who flew in war there should be instituted an order of knighthood, Mr. Wells wrote about this time: "The task that we are asking from our aviators is one of the most dazzling and terrible that men have ever faced. The single combats that distinguished the age of chivalry, when champion rode against champion in front of the closing hosts, were but tame exhibitions before the starry deeds these men will have to do. Up they will have to go, to dash themselves into Zeppelins, to slash the Zeppelin envelope with trailing knives, to outfly the hostile aeroplanes and pick off the pilots—duels in the giddy void in the sight of armies. So at least it seems to me such fighting must be done. . . .

"And there is something more. We owe these men honour. Our common men are brave, but these men who fight in the air will be something more than common men. They will be the aristocracy of the army. No man fights the worse for the knowledge that the world regards him. Whatever else is kept from us, one thing we must have from the front, and that is the story of every such encounter as I have foreshadowed, and the names of the men who did the thing. Nothing can be too

The Great War in the Air

good for such men." Mr. Wells's eulogy is no worse than his prophecy. And perhaps both were inspired, to some extent, by the terse, unimaginative reports that emanated from G.H.Q.

Though, as Sir John French himself admitted in his dispatch, published on September 11, "quite one of the features of the campaign, on our side, has been the success attained by the Royal Flying Corps," he does not see fit to outline that work further than: "To give a rough idea of the amount of work carried out it is sufficient to mention that, during a period of twenty days up to 10th September, a daily average of more than nine reconnaissance flights of over 100 miles each has been maintained." And again on the 24th, as "items of news" he reports that: "Recently a pilot and observer of the Royal Flying Corps were forced by a breakage in the aeroplane to descend in the enemy's lines. The pilot managed to 'pancake' his machine down to earth, and the two escaped into some thick undergrowth in a wood. The enemy came up and seized the smashed machine, but did not search for our men with much zeal. The latter lay hid till dark, and found their way to the Aisne, across which they swam, reaching camp in safety, but barefooted." For this diffidence on Sir John's part there were the very best of military reasons, but these were not apparent to the general public, who, with the greatest avidity, seized upon any more detailed information that chanced their way, unmindful as to its authenticity or source of origin.

Early Air Fighting Tactics

In a glut of these same unvarnished rumours it is refreshing, to say the least of it, to find a narrative that one can trust to the smallest detail; the personal story of a wounded sapper of the Royal Engineers. Following a very hard fight on the day before, he was lying on the ground with his regiment resting, when suddenly a German aeroplane hove in sight. It flew right over the British troops and commenced to signal their position to the German lines. A minute later, amid intense excitement of the troops, two aeroplanes, with British and French pilots, rose into the air from the British rear. Ascending with great rapidity, they made for the German

The Royal Flying Corps

aeroplane with the intention of attacking it. Says the soldier : "At first some of our men, who were very much on the alert, fired by mistake at the French aeroplane. Luckily their shots went wide.

"Then the troops lay still, and with breathless interest watched the attempts of the British and French aviators to out-manceuvre their opponent and to cut off his retreat. After a little time the French airman abandoned this attempt, and then the Briton and the German began to fly upwards, in the evident desire to obtain a more favourable position for shooting down from above. Owing to the protection offered by the machine, it would have been of little use for one aviator to fire at his opponent from below. Once a higher altitude was attained the opportunity for effective aim would be much greater.

"Up and up circled the two airmen, till their machines could barely be distinguished from the ground. They were almost out of sight, when the soldiers saw the British aviator was above his opponent. Then the faint sound of a shot came down from the sky, and instantly the German aeroplane began to descend, volplaning in graceful fashion. Apparently it was under the most perfect control. On reaching the earth the machine landed with no great shock, ran a short distance along the ground, and then stopped.

"Rushing to the spot, the British soldiers found, to their amazement that the pilot was dead. So fortunate had been the aim of the Englishman that he had shot the German through the head. And in his dying moments the latter had started to descend."

There can be little doubt as to the authority of this tale, but the same cannot be said of hundreds of similar ones that were circulated about this period; some of them even at the instigation of enemy propagandists. The public believed anything about the air. It was not their fault, however. The ratio between flying and the military movement had not yet been firmly adjusted. Military aviation was still in the throes of development and experiment. And it was not until the beginning of September that the air began to assert itself in anything like definite proportions. Then two facts predominated : the overwhelming superiority of Germans in number of pilots

The Great War in the Air

and available machines; and the sharp definition in the work of the aerial services as scouts and as instruments of destruction. But, before considering these phases in detail, it will be necessary to review the entire war situation at this date.

The historic British retreat from Mons, the manner of which excited the interest of the whole civilised world, was already well under way. The fate of Paris, and, indeed, the whole of France, had weighed dangerously in the balance; recovered, slackened, and re-asserted itself beyond all possible doubt. Before the Homeric thrusts of the British, von Kluck's great armies lay spent and panting. The war, as history now shows, had been won and lost; won to the splendidly organised German drive through Belgium; lost by the providential interference of the sharp eyes of an aeroplane observer, thousands of feet up, swaying above the serried battle-lines. At the critical moment in the great German enveloping movement, that aerial report disclosed to Sir H. Smith-Dorrien the fact that his advanced Division was faced by three German Army Corps supported by strong reserves in place of the three Divisions which he had been led to think were opposing him.

Now came the time when a doughty blow was to be struck at the overwhelming German superiority in the air; the war among the clouds to begin. The German had played his last card, to be trumped by the military genius of Generals French and Joffre. In the wearying, strenuous, ding-dong nature of the trench-war, that was to follow, aerial warfare developed beyond imagination. Came a pause. Also came a pause in the air. The sadly harried units of the R.F.C. found time to sort themselves out from the general mêlée; to develop some sort of plan of campaign.

France's Aeroplane Policy

From the view-point of later developments the student of history is apt to be so bold as to criticise French's policy with regard to his planes, which, in direct opposition to the enemy dictum of incessant destruction, was that: "In pursuance of the principle that the main object of military aviators is the collection of information, bomb-dropping has not been indulged in to any great extent." But, so far as it went, this

The Royal Flying Corps

concentration on aerial reconnaissance, at least, rendered better service than any other of the belligerent services.

As an official eye-witness at this time admitted: "Both for the location of targets and the communication of the effect of fire, reliance was placed on observation from aeroplanes." The constant object of British airmen was also to effect the accurate location of the enemy's forces, and, owing to the fact that the operations covered so wide an area, to locate British units. How perseveringly the early pilots on their decrepit aeroplanes were to spy out the land for the hidden, often invisible, armies below, may be gauged from the fact that, up to September 21, the distance flown by British airmen since the beginning of the war amounted to 87,000 miles, an average of 2,000 miles per day, the total equalling nearly four times the circuit of the earth. For this time spent in the air was 1,400 hours. Flying activity varied from day to day; and it is surprising to find to what extent weather conditions influenced aviation at this early period of the war. Given a clear, sunshiny day, with little wind, the airmen would be hard at it, skimming around energetically between grey clouds and blue sky, from the first streak of dawn to the last faint glow of the twilight. But should the weather prove the least bit stormy, the planes would not be removed from their hangars. So September, 1914, came in; mist and rain, fog and cloud. Blindly making their way over the grey mists of the earth's surface, the airmen were helpless, their reports useless. Aircraft work, at least to any serious extent, had been reluctantly abandoned for the winter, when again the sun came breaking through the grey mists. Crisp and clear, the autumn air proved ideal for the purposes of aerial reconnaissance. But in the first glare of unaccustomed light, in the hazy valleys bathed in sunlight, not a man, not a horse, not a gun, not even a trench was to be seen. There were only flashes, smoke, and noise. Then the British aviators commenced to find their air-legs. Every hour of the day they would be hovering over the German lines, like a hive of bees in swarm. No movement of enemy troops, no bringing up of reinforcements was missed; a new gun-emplacement, the preparations for a new trench or line, a train running ten minutes outside its scheduled time; each and every incident

The Great War in the Air

would be reported to the staff at G.H.Q. within a half-hour of its occurrence. The essence of military strategy is surprise; but the use of aerial reconnaissance was to enormously lessen the chance of it. "Acting on the principle that the longest way round is the shortest journey," reported the *Daily Telegraph* of the effects of this first concentrated burst of British aerial activity, "they [the Germans] took the troops fully 100 miles by rail by a semicircular route, hoping thereby to escape the vigilance of the flying sections, which have become the eyes of the armies. If they had anticipated that they could move several army corps without the aviators catching sight of them, they have been woefully disappointed. The movement was noted before it began.

A German Offensive Spoiled

"The part the aviator is playing in this war will receive its due praise from the historian. The generals of the Allied forces have already commented on the energy, enterprise, daring, and soldierly qualities of the flying men, and to-day they must congratulate themselves upon the support the aerial scouts have given in the latest phase of the campaign. Reconnaissance work by flying squadrons disclosed the fact that a vast quantity of railway stock was being concentrated in the eastern theatre of war. It was not all on the lines close to the positions held by the enemy; that would have meant congestion, and no aviator would assume that crowded railway tracks would mean a speedy entrainment for another portion of the battle-line. But the fact that every siding for thirty or forty miles held an empty military train suggested that an important new movement was about to be started.

"Various reports from the aerial scouts had to be compared before the real motive of the enemy could be discovered. Did it mean that the Germans intended to evacuate the whole line? That idea was dispelled by the absence of any report by the British and French aviators on the west that large quantities of railway material were being assembled in the regions they watch so closely. East, centre, and west would have to begin together a general retirement, and if one commenced an operation without any reply from the other it was obvious that

The Royal Flying Corps

retirement was not the object." Again the account is given in the words of a wounded British flying officer.

"On a recent occasion," he observed, "a number of airmen were sent out on reconnoitring duty over the German lines, their main object being to discover whether the enemy was being reinforced. They were absent several hours, but reported on their return that there was no abnormal movement of the Germans, except that for some miles in their rear there was an enormous number of transports—miles of them—proceeding rapidly to the front. This incident was reported to headquarters, but was not deemed sufficiently complete, and immediately day broke on the following morning the airmen again rose and passed over the enemy's lines. They then found that reinforcements to the number of three army corps had arrived during the night and were rapidly taking up their position for attack.

The Army that Disappeared

"It was quite evident to the flying men that the miles of covered transport wagons which they had seen proceeding to the front on the preceding evening were packed with German soldiers. The important news was at once conveyed to the British and French commanders, and necessary measures were taken on our side to meet the new condition of affairs, with the result that the Germans were repulsed with heavy losses, no doubt to their intense surprise, as the points they attacked in such overwhelming numbers had not been strongly protected.

"An extraordinary case of a whole German army corps being lost by our aerial and land scouts occurred a few days ago. Two German army corps," the officer continued, "were observed by the British scouts to be marching to the woods at Vermand, and a sharp lookout was kept to observe the direction they took. Subsequently one corps was seen to reinforce the German troops at St. Quentin, and the other was completely lost sight of. It is supposed that the men concealed themselves in the forest at Vermand, where they could be observed neither by aircraft above nor by scouting parties on land. Probably the soldiers left the woods in small numbers at different times, and joined the main body at a previously arranged rendezvous.

The Great War in the Air

Such an incident would, of course, greatly confuse their opponents. A similar disappearance of an army corps took place some time ago at the forest of Compiègne."

In this period of activity commenced that five-year series of aerial adventures that have proved no more incredible than always delightfully varied. One of the very first of these adventurers was Gordon Bell, one of the greatest of Britain's pioneer airmen; later, unhappily, to go down during a fierce aerial combat over the German lines. Bell had a remarkable escape after he had been hit and his machine disabled in the battle of Mons. While he was scouting, at a height of 4,000 feet, he was hit in the foot by a bullet. He immediately went up to about 5,000 feet, but again some German found the mark, the bullet this time striking the engine and smashing it.

"I was at this time," he said, "right over the German position. I turned as quickly as I could and steered my disabled machine in the direction of the British lines.

"It was touch and go, but luckily I was high enough to plane three or four miles before dropping.

"I set off to tramp to the British lines. I had not gone far before noticing in a field on the left a small mound topped by a little wooden cross.

"Something prompted me to investigate. It was the grave of a British airman. The machine must have fallen close to the road between Enghien and Ath. Belgians near the place told me the officer was shot down by a column of German infantry, the strength of which column he was evidently trying to discover. The aeroplane had been totally destroyed, but on a twisted plate I found the name of an English firm. There were also in the wreck paper forms for making out reports on reconnaissances. There was no writing on these, but the printed matter was in English.

"At the head of the grave the Germans had put a wooden cross, on which they had written 'Herr Flier, August 22nd, 1914.' The Belgians had covered the grave with flowers. It should not be difficult to find. It is on the left-hand side of the road as one walks south from Enghien to Ath, in a pear orchard, near a very old red-brick house with a square tower.

"I got to the British lines safely, and was invalided home."

The Royal Flying Corps

Following the progress of the work of the British observers at this period is like unravelling the plot of some great detective story. Item by item, incident by incident, thread by thread, the whole deeply laid plan of the German dash for the Channel ports was laid bare by those eyes from the air, that, themselves often invisible, missed no single movement on the earth's surface beneath; while the climax of this first herculean effort is to be found in the British Official dated September 17th, 1914 :

"About September 3rd the enemy appears to have changed his plans and to have determined to stop his advance south direct upon Paris; for on September 4th air reconnaissances showed that his main columns were moving in a south-easterly direction generally east of a line drawn through Nanteuil and Lizy on the Ourcq. On September 5th several of these columns were observed to have crossed the Marne; whilst German troops, which were observed moving south-east up the left bank of the Ourcq on the 4th, were now reported to be halted and facing that river. Heads of the enemy's columns were seen crossing at Changis, La Ferté, Nogent, Château-Thierry, and Mézy. Considerable German columns of all arms were seen to be converging on Montmirail, whilst before sunset large bivouacs of the enemy were located in the neighbourhood of Coulommiers, south of Rebais, La Ferté-Gaucher, and Dagny."

The Direction of Artillery Fire

In aerial observation, however, reconnaissance was but a preliminary stage. Of what value would be the information that a new German ammunition dump had been set up, say, three miles N.E. of Ypres, if such dump were allowed to remain undisturbed? What is originated in the air must be finished in the air. And in this respect the Flying Corps was the completest unit of the modern military machine. Not only did it establish its own objective; to seventy-five per cent. the responsibility of the realisation of that objective was due to the observational skill and wireless work of the "Art. Obs." Ultimately—if the position was not too distant—the heavy artillery it would be who would administer the *coup-de-grâce*. Without the aid

The Great War in the Air

of the eyes from the air considerable ammunition, time and patience might be expended in the two or three days that would be necessary with the surface direction of fire. The "Art. Obs.," the artillery observer, then came to be one of the most useful young men in the aerial war. Yes, young! Despite the patient, resigned lines puckering his young forehead, suggestive of incessant harangues with aged but amateur armchair, gold-braided aerial tacticians; and the sad, sunken look about the eyes, that could simulate, at the slightest provocation, the wounded yet respectful dignity that proved such a thorn in the side of the senior, though ignorant, superior surface commander. By force of habit, and calling, he was blasphemous—and full-lunged; by nature, headstrong and daring; possessing a combination quality, suggestive of the vigilance of an eagle and the instincts of a kingfisher, with a touch of the hovering seagull thrown in. He was the all-time dog for the invectives of the erratic marksman of the artillery. The heavy artillery, its ideas, methods, ways, personalities, personal appearances, and family relations, was as frequent an objective of the "Art. Obs." as were the German positions. But it was give and take in the best of feeling. Aircraft and artillery all the time worked most harmoniously, their mutual respect strengthening with the development of artillery work in the war, that was, in due time, to become the greatest factor in the fighting. Already a description of target-registering and counter-battery work had been given by an official eye-witness with the British armies. Says this eye-witness: "Balloons of the so-called 'Sausage' pattern remain up in the air for long periods for the purpose of discovering targets; and until our aviators made their influence felt by chasing all hostile aeroplanes on sight, the latter were continually hovering over our troops in order to 'register' their positions, and to note where headquarters, reserves, gun teams, etc., were located. If a suitable target is discovered the airman drops a smoke ball directly over it or lets fall some strips of tinsel which glitter in the sun as they slowly descend to earth. The range to the target is apparently ascertained by those near the guns by means of a large telemeter, or other range-finder, which is kept trained on the aeroplane, so that when the signal is

The Royal Flying Corps

made the distance to the target vertically below is at once obtained."

For all practical purposes the raiding aeroplane was nothing more and nothing less than a long-range gun. When the objective was beyond the range of the heavy artillery, the plane, instead of directing the fire, fired itself, in the manner of dropping an incendiary or high-explosive bomb. But though, later in the war, air-raiding was to become one of the features of the campaign, up to October 16th, 1914, there were only three recorded instances of British raids. Nine bombs were dropped by a British airman on Laon, on September 30th of the same year, while the next bombing incident was one of some note; a daring expedition on a Rhine airship shed. As the Englishman swept into sight over his objective, every available anti-aircraft gun in the locality opened an intensive fire upon him. Despite this desperate barrage, however, he flew lower and lower, until suddenly it appeared as if a shell must have hit his machine. To all intents and purposes the raid was over. But it was only a clever subterfuge on his part. He had not been hit in reality, but was taking advantage of this misapprehension on the part of the enemy gunners to sweep still lower towards the roof of the shed. When right over the latter he dropped a bomb, causing a terrific explosion in the building. And then he rose to a great height and got clear away. Two days later, again, a British bomber succeeded in hitting the ammunition wagon of an enemy cavalry corps, causing indescribable confusion and great loss of life. The bomb struck the leading lorry loaded with cartridges, and it went up immediately. Sweeping backward with the wind, the resulting flame fired three vehicles in the rear, with a similar result. Behind them the panic-stricken horses of the column commenced to stampede, dashing into one another and jamming in a desperate attempt to pull out. It was too late, however. And the horrors that scene presented with the next day's dawn—the raid had taken place at night—beggars description. The convoy was a mangled mass of flesh and iron. While along the road lay fourteen motor-lorries which were no more than skeletons of twisted iron, bolts and odd fragments.

CHAPTER III

THE AUTUMN CAMPAIGN IN THE AIR

In the Eastern Theatre of War—Exploits of Kusminsky, the First Russian "Ace"—German Zeppelins meet with Disaster—German Airmen at War—Tactical Air-Raid—A Great Adventure—Violating the Hague Convention—The French Aerial Front—Individualism in the Air—Vedrine and "La Vache."

THE rapid development of aerial activity on the British Front in the early autumn of 1914 is apt to mislead the casual reader. It should be understood that the narrow sector from Ypres to the Belgian coast was then of but minor importance. While Britain was still mobilising her Expeditionary Force German aviators carried out several primitive raids on French territory, and the aerial war against Russia was well under way. In the Eastern theatre of war, particularly, the enemy was concentrating his aerial energy. As part of the grand scheme of strategy of this campaign it was essential to Germany that Hindenburg's armies should hold back the Russian millions within their own frontiers until, firstly, France and Belgium had been overwhelmed; and, secondly, the Channel ports were within the German grasp. Afterwards Russia was to be suitably dealt with.

From every point of view, then, the German found it essential that the Russian reconnaissance machines should be prevented from reconnoitring Hindenburg's lines. Every available pilot, observer and aeroplane that could be spared was dispatched post-haste to hold the Interburg-Nordenburg-Frankenau line for this purpose. But, as we have already seen, for this contingency our easterly Ally was more than prepared, and finding that, as the Germans met with greater resistance, they brought up further aerial reserves, the Russians redoubled their efforts.

Enormous air bases and aircraft construction factories

The Autumn Campaign in the Air

sprang up in all parts of that great country. To give a rough idea of the output capacity of the latter, one cannot do better than quote an extract of a *Morning Post* correspondent's message, 'written from Petrograd at this period: "I was accorded the exceptional privilege in war time, even for an ally, of visiting one of the Russian great aeroplane factories. Several have been established to keep up the large supply required by the various armies in the field. The one I visited can turn out five aeroplanes per day, or thirty a week. Imagine a London railway terminus, considerably reduced in size and with a broad gallery running round half-way to the roof. That is the fitting department. The whole floor area is crowded with completed aeroplanes in the rough, some awaiting their engines and others certain other pieces of mechanism used in active war in the air. Around this central hall and communicating with it are a series of buildings for the preparation of the various parts, for everything, including the engines, is entirely constructed on the spot. Construction has been standardised, and many are the ingenious contrivances for simplifying the various processes of manufacture.

Russian Mass Production

"Except perhaps the building of a ship, which is a slow process to grasp, I can imagine nothing more engrossing than the rapid assembling of these modern hawks by a few skilled workmen. When completed they are lowered down from the gallery to the floor of the great hall. Thence they proceed to the flying grounds for the testing of the engines, and they have to be passed by an inspector, a skilled aviator, before being dispatched to the army. As boxed for the railway the entire aeroplane is got into a solid packing-case which might contain, say, a couple of grand pianos, but rather longer. Thus packed, they fear nothing in transit, and are easily and rapidly got to work when they arrive at their destination."

The Russian airmen meanwhile had already achieved a standard of airmanship unexcelled throughout the war. Captain Nesteroff, a pre-war airman of some considerable standing, had carried out an aerial manoeuvre, of which there are but three recorded instances for the whole five years; but, unfortunately,

The Great War in the Air

had paid for his daring with his life. After performing some highly successful aerial reconnaissances, Nesteroff, seeing an Austrian aeroplane hovering over the Russian forces, at once set out to attack it, in order to prevent it from dropping its bombs. In vain he fired at the obstinate enemy round after round of ammunition until, finally, it ran out. The Austrian, however, still continued on his way. Realising the position was now desperate, the Russian airman, taking his life in his hands, charged deliberately and directly at the Austrian machine, which was destroyed by the impact. Both men were instantly killed.

This instance, however, but meagrely illustrates the invaluable results achieved by this splendid service at the time, results that are far better explained, with closer detail, in the personal narrative of another Russian airman, Kusminsky. The latter describes a long flight he made over the German lines with an officer of the General Staff. At the start they flew along the Russian lines, then turned sharply towards the enemy. With them there ascended two other aviators. Each had a different mission, and they soon lost sight of one another.

According to the orders of his commander, Kusminsky and his staff officer passenger had to keep within view of the highway. They flew very high, the barograph indicating between 1,300 and 1,350 metres. At times they went even higher, and it was so bitterly cold that they almost froze. Successful scouting, however, proved to be quite possible as the air was very clear. Through Zeiss binoculars they could distinguish different portions of the enemy's army, and even identify carts loaded with stores.

"When not far from the Russian frontier, and still at the great height," says Kusminsky, "we suddenly heard an explosion, and the whole apparatus quivered and leapt in the air. We found that the suction valve of the motor had burst. We were saved from destruction by the self-possession of my officer. He kept his head and did not move a muscle, so that I was able to shut off the benzine and open the contact. We began to descend in a volplane, and to avoid capture by the enemy did our utmost to prolong our flight in the direction of the Russian lines.

The Autumn Campaign in the Air

"Although we had a very good map we could not tell precisely where we were. At last as we touched the ground we saw in the fields not far away a crowd of peasants.

"The officer at once shouted, 'Soak the apparatus with benzine and get matches ready, so that if they are Austrians we can set the whole thing on fire.' But we had no need to do this, for they were Russians.

"We had come down about three miles within the Russian frontier, and soon a party of our own troops arrived and carried us back to their quarters."

Zeppelins on the Russian Front

As these events were taking place the great Russian drive was going on from one glorious victory to another. Rennenkampf's first advance had swept everything before it. The battle of Gumbinnen had been decided, an overwhelming victory to the Russian forces. Samsonov's advance in the south was well under way. And the Germans, finding that their original scheme of holding up the Russian forces had proved a dismal failure, and that the Russian aircraft were daily, almost hourly, hovering over their lines, determined upon an instant change of aerial policy. The majority of the aeroplanes were dispatched to the Western front, where other similar craft were already rendering invaluable assistance to the direction of artillery fire in the now almost stationary condition of trench-warfare, and half a dozen or so latest type Zeppelins were substituted in their place.

If the Germans had imagined that any useful purpose would be gained by this change of craft they were soon to be grievously mistaken. The accuracy of the Russian aircraft gunners had developed enormously in the meantime. Within two days the first giant airship had been brought to earth, a mass of roaring flames. Two railway trucks conveyed the mangled remains to Petrograd. The greater part of the envelope had been destroyed by the explosion of gas which it contained, but the car, with its fittings and four propellers, were in a state of comparatively good repair. Two other Zeppelins of this type—one shot down in the dead of night—were added to the Russian gunners' "bag" within a week.

The Great War in the Air

The destruction of the fourth victim was something of a more impressive affair. A Russian cavalry brigade, with a horse battery, was proceeding towards the frontier, when a German airship was sighted steering straight for it from the direction of Mlava. As the commander of the battery was at that moment with the chief of the division at the tail of the column, fire was at once opened at this enticing target, but the shots appeared to fall short. The range was increased, and at the third volley the airship began to assume a vertical inclination. This, as was shown later, was due to the breaking of the stabilisator and rudder by gun fire. However, the airship continued on its course towards the German frontier, though travelling slowly, and disappeared behind a wood to the left of the battery.

Without losing a moment the guns were taken round the wood at the gallop and renewed their fire. While they were on their way the airship flung down bombs at them, but without any success. It then directed a machine-gun upon them, but the bullets fell short and did no damage.

From the new position only one volley was fired, as the dirigible now stopped for a moment and then was carried back by the wind towards the south. Quickly the battery galloped back to its first position, whence the airship was finally disabled and compelled to descend within three miles of the village of Lipovitz. Several cavalymen, with the senior officer of the battery, were sent to receive the prize, but when they reached the airship they found they had been anticipated by a Cossack patrol, which seemed to have sprung out of the ground. The prisoners taken were the commander of the Zeppelin, Captain of Airship Battalion Gruener, Lieut. Wilhelm Rehling, the mechanic, and four soldiers. One officer and two lower grades had time to hide in the neighbouring village, but were discovered on the following day. Thus the whole crew of ten were captured. Lieut. Rehling had torn off his officer's epaulets in order to conceal his rank. Only one officer and one soldier were wounded, but the apparatus had been badly damaged in the air. The rudder, propellers, benzine tubes, motors and stabilisator had all suffered, and the hull had been pierced in several places.

The Autumn Campaign in the Air

According to the admission of Captain Gruener, the airship was vitally injured by the first Russian discharge, but its dirigibility was completely destroyed by the fire from the second position. When the Russian artillery commander asked, "How could you dare to steer so impudently direct for our battery?" Gruener replied that he had more than once been under cannon fire and had always come out successfully.

The hull was eventually blown up by the Russian cavalry, but a large number of trophies were carried off. They included an army flag, with the name "Zeppelin 5" and the embroidered Prussian eagle insignia of the order "Pour le Mérite," two machine guns, a machine rifle, four motors, many plans, maps, sketches, documents, photographic apparatus, and forty signal rockets. All the bombs had already been used. Some of them had been thrown on to Mlava station, where several Russian soldiers were killed by them.

German Airmen at War

Other events that occurred in the air in this theatre of war up till the early spring of 1915 were all of them of a more or less subsidiary nature. The aeroplane materially helped the way to the last great Russian coup in East Prussia. During the fighting in the Vistula region the Novogeorgievsk aviation detachment proved so successful as to drive every enemy machine from the air in the region of the Russian lines. One more than usually exciting incident is there, however, worthy of mention. This same squadron, while patrolling one day, intercepted a German machine. The German mounted higher and higher, hoping to shake off his pursuers. Suddenly the German dropped, but the Russians were after him. He mounted again to so great a height that the machine was covered with frost, the propeller was working irregularly, and the airman was half frozen. Realising the impossibility of escape the German made a volplane, still with the Russians in attendance, and landed in the Russian lines, where he was captured.

The Germans revenged themselves for these tactics by a wholesale dropping of bombs upon Warsaw. Simultaneously with this dropping of bombs, packets of pamphlets in the Polish

The Great War in the Air

language were distributed, stating that the population must not fear the Germans, as no civilian would be injured and only Government property would be destroyed. This pronouncement, however, proved ludicrous, for all the property damaged in the city belonged to civilians.

It is no exaggeration to say that, to realise the supreme importance of aircraft in war, to put that realisation into practice, and to work out some sort of co-operation with the ground forces, Germany was first of all the belligerent nations. Any form of aerial strategy or of aerial tactics, however, had thus far small opportunity of defining itself. Aircraft were still under the direct command of infantry and artillery generals, and, resultingly, their operations were confined to the areas of activity of the infantry and of the guns. The strategical aeroplane, working fifty, eighty, and a hundred miles beyond the front line trenches, in purely individual enterprise, had not yet been thought of. Though, to be sure, the German High Command was already planning in secret a long series of devastating raids on British shores. Before the latter part of the autumn their raiding machines were being concentrated at bases along the Belgian coast for this purpose. Heyst was the principal point of mobilisation, the machines arriving by rail direct from the factories in Germany. Very soon the inhabitants were treated to exhibitions of short trial flights above the plain between the sea and the city of Bruges. The German frontier guards began to exercise special vigilance on the roads leading to Holland from Western Flanders, especially north of Zeebrugge and Westcappelle. This increased severity was, doubtless, intended to prevent details of the plans for air manoeuvres reaching the Allies through neutral territory. However, this proved to be the solitary instance of any strategical move.

Of tactical raids, on the other hand, there had occurred well-nigh half a hundred, and German aircraft were being put to all manner of local purposes. Two aeroplanes, for instance, were told off constantly to patrol over the Kaiser's headquarters for a radius of five miles on either hand. A month later aircraft were utilised to send messages recalling some thousands of German troops stationed in the little villages near Courtrai to reinforce those at Charleroi. As has already been recorded, a

The Autumn Campaign in the Air

novel use for aircraft had been found as propagandists on the Russian front. And for spotting the allied heavy artillery and directing the counter-battery fire two classes of aircraft were being employed every few miles along the German front. Immediately allied reinforcements of troops or guns came up toward the firing line, the enemy, with his customary thoroughness, set to work to locate the new arrivals. Cigar-shaped kite-balloons were flashed up against the face of the sky. Out of range of the allied guns these aerial monsters remained up for hours on end, proving a constant thorn in the side of our gunners. Almost immediately our guns started the enemy guns would roar out in reply. Then, if the balloon failed to range them correctly, aeroplanes would be dispatched in closer proximity to the intended targets. These pilots would fulfil the double purpose of directing the enemy artillery fire and reconnoitring the allied positions.

A Pistol Duel in the Air

German reconnaissance, by this time, had been reduced to a fine art. Their airmen performed excellent service, but were gradually giving way mile by mile to the determined onslaughts of the British battleplanes. The British were already proving themselves to be daring and relentless enemies, and an encounter of this nature is ably described by Sergeant Werner, one of the earlier German "aces," and one of the first of the enemy pilots to fly over Paris. "I received orders," Werner said, describing this incident, "to locate the English and French forces, and, accompanied by another officer as an observer, I flew southward from Mons, following the main road leading to Paris, which led along the edge of a magnificent forest in which more than forty thousand inhabitants had taken refuge.

"After flying for an hour we located the English, and saw where the French artillery was taking up a new position, together with the English, and preparing to make a stand. Having obtained the desired information the observer with me made a rough sketch. I turned the monoplane to start on the way back, when suddenly I looked up and saw a thousand feet above us a Bristol aeroplane. It was pursuing us. We were

The Great War in the Air

5,000 feet up, but my monoplane was slower than the Bristol, which soon caught us up. I tried in vain to climb above the Bristol, which was directly over us. I expected every moment a bomb to hit us.

"The English machine swooped lower and lower, until it was only 500 feet directly over us, and I felt like a bird when an eagle or a hawk is sweeping down on it. I thought it was getting nearer in order to get a better aim for a bomb. The experience was absolutely nerve-racking. Both the other officer and myself began shooting automatic pistols at our pursuer, as it was now evident that the Englishman had no bombs. Fortunately for us, our propeller was in front, and they could not shoot at us that way. The biplane suddenly veered to the side and lowered to about 150 feet higher than we were and 500 feet distant. The pilot and his observer began shooting at us, but the noise of the motors drowned the reports. We could, however, see the flashes of the pistols. The duel continued for half an hour. Evidently the Englishmen, while speedier than we, were armed only with pistols. Minute after minute, each of which seemed hours, I began to feel helpless, and felt ourselves slower and unwieldier, and thinking every moment would be the end. My observer touched my shoulder and pointed up.

"I looked, and there, a thousand feet higher, coming at a tremendous speed, was a small French Bleriot, like an eagle, to join in the attack. It was speedier than the Bristol, and soon was encircling us, crossing before us, swooping down and then away, vivid flashes showing that it was firing at us. I thought our end was certain then, when our troops suddenly appeared beneath, firing at the Bleriot and the Bristol. They immediately turned and disappeared."

"The British Forces are Disorganised"

Of the many aerial adventures, grave and gay, that occurred to German airmen in those clear, sunny autumn days of 1914, Werner's encounter was but typical. Here are two further instances, the first of which was to prove only too disastrous to the enemy pilot concerned. It occurred during the battle of the Aisne, somewhere about September 17. A German

The Autumn Campaign in the Air

aeroplane flying over the British lines was caught in a heavy fire, and a sudden rocking of the machine indicated that a bullet had been well placed. However, the German airman was able to turn to the north, and it looked as if he would land safely among his own people. His machine at first descended very gradually, but when it was within a few hundred feet of the ground it fell precipitately, and there was no possible doubt as to the result. The opinion that the aeroplane was smashed was confirmed later the same night, when a French officer of infantry and several men came into the British lines and reported that they had been prisoners in the hands of the Germans, but when the aeroplane fell close to them there was so much confusion among the enemy guarding them that they escaped. The other case, quite apart from its amusing aspect, served as an invaluable insight into German psychology. One fine morning, at an aerodrome close behind their front-line trenches, there arrived in hot haste a breathless pilot, who reported that the British forces were thoroughly disorganised and were running about their post in blind panic. Careful investigation on the part of other enemy observers, however, revealed nothing more alarming than the fact that the troops in the British second line at certain spots were passing their well-earned rest punting a football about on the village "places."

The Tale of Five Taubes

Three days later the enemy was to suffer his first serious aerial loss. Though, curiously enough, this occurred not thousands of feet up in the heavens, but in the sheltered seclusion of a small wood far back in the enemy's own country. Twenty daring French cavalymen, penetrating deeply into some thickly wooded country, came upon a clearing in which there was a rich prize. Aviators and a number of mechanics were engaged in overhauling five Taube aeroplanes, and the patrol made a dash to round up the lot. There was a fierce resistance, and twelve of the cavalymen were killed before the small air force was defeated. But those aeroplanes never flew again.

Meanwhile, further and wider developments had been taking

The Great War in the Air

place in the enemy air service. Within four months of the outbreak of hostilities the aircraft output had trebled itself, and feverish experiments were being carried out with types of aircraft copied from machines captured from the Allies. For purposes of observation at many points in the front line captive kite balloons were substituted for aeroplanes. It was to prove, however, a costly experiment. Operating some distance in rear of the German first line, their reconnaissance lacked both the detail and the accuracy of the aeroplane hovering directly over its target. As a consequence the damage being done to the British was wholly disproportionate to the amount of ammunition expended. And anti-aircraft gunnery on both sides was becoming daily more accurate.

"Tip and Run" Bomb Dropping

The indiscriminate nature of the early German series of air raids perhaps may be due to this reason. Anti-aircraft fire has always possessed unusual terrors for the enemy aviators. The latter, it must be admitted, invariably preferred "safe"—beyond the range of "archies"—altitude for their reconnaissance work, and superiority of numbers in an aerial combat. Their policy of bomb-dropping was apt to be rather of the "tip and run" variety. Once having sighted his objective, the enemy would disencumber himself of his cargo of bombs, without knowledge or thought as to their destination, and make off for home as fast as his engine and a providential "down" wind would carry him. Thus the results of his bombing showed but poorly by comparison with the large number of raids that were made by his airmen.

Within a period of eight weeks, including the Warsaw raids, and apart from a long series of vicious raids upon the French capital, visits were paid by German airmen to Ostend, Dunkirk, Calais, Ghent, Luneville, Pont-à-Mousson and Nancy. Considerable execution was done among the ranks of the French cavalry, and German bombs annihilated Charleroi railway station. These raids were carried out by both aeroplanes and airships. In fact, one of the latter, a "Schutte-Lanz," on one occasion hovered for thirteen hours over Lublin, dropping an occasional bomb. During this period it was

The Autumn Campaign in the Air

attacked not only by the Russian infantry but by the artillery, and its rear gas cells were struck twenty-five times by rifle shots. Repairs to the cover of the balloon were carried out during the flight, in the course of which the commander succeeded in making numerous observations. On returning to German headquarters the crew, none of whom was injured, were accorded an unusually enthusiastic welcome.

Bombing British Headquarters

By the end of August enemy airmen had paid their first bombing visits to the British Expeditionary Force. Cambrai station was badly damaged and the railway bridge totally destroyed. In several operations over the main British camp, the Germans, with a preliminary savour of their war methods, employed machines bearing the French colours. Fortunately, however, there were no more than two casualties. General Headquarters at St. Omer were the next to suffer by these gentle attentions. On October 14 a German airman flew over, and five bombs were dropped, resulting in the death of two women and a little girl. The following morning, coming to repeat the attack, this unwelcome visitor was brought down by machine-gun fire, and both observer and pilot were captured. The pilot was decorated with the Iron Cross, which, according to his own account, had been awarded to him as being the first German to drop a bomb on Antwerp.

As was only natural, the civilian inhabitants of these—for the most part—defenceless towns soon began to protest against this unusual method of warfare, constituting as it did a direct violation of the ruling of the Hague Convention. That they were justified in their protest may be judged from the fact that the sole result of the unmerited German aerial attack on Amiens, October 16, was the wrecking of a tramcar, with consequent injuries to the driver and one passenger, in the vicinity of the Saint-Acheul station. The population of Ghent seethed with indignation when, on September 14, two bombs were dropped in the main street. For this act there was not the slightest excuse or justification. Ghent was a purely industrial city, with no fort or other means of defence.

The French pilots very rapidly settled down to steady work,

The Great War in the Air

if such a phrase can be used to explain the mental attitude of so mercuric and adaptable a body of men.

"They give information to our commanding officers, who find in them an invaluable auxiliary, concerning the movements of the enemy and the progress of columns and supplies. They are not liable to be stopped like cavalry by uninterrupted lines of trenches. They fly over positions and batteries, enabling our forces to aim with accuracy. They drop bombs on gatherings of troops, convoys, and staffs, and are an instrument of demolition and demoralisation."

The above official announcement of the French Government may be said not only to be characteristic of the work of the French airmen at this period, but of the autumn campaign throughout, and, indeed, of the whole five years of war. 1870 was more than avenged by *les aviateurs*, 1914; by contrast it was glorified. In face of an overwhelming German superiority in machines and personnel, and though acting for the most part on the defensive against the altogether unwarranted enemy aerial campaign against Paris, the French airmen would not be gainsaid. The fruit of their daring was ripe through every line, trench, base and position of the sullen grey hordes that came swarming like locusts across the fair fields of France and swept to the Belgian coast. At the Marne a German ammunition column was blown sky-high. Freiburg station was left a mass of shattered masonry and dead and dying soldiery. Swooping down like hawks through a deadly anti-aircraft bombardment, the daring Frenchmen reduced an entire transport park at La Fère to ashes. Here it was the bombing and destruction of six enemy planes in one hangar; there the destruction of two food trains; again, the wiping out of artillery emplacements, or, again, a vital headquarters disorganised and in panic. And Metz, well across the German frontier, was visited with all the precision and regularity of some everyday practice flight.

Before such an epic of the immortal glory of France even the cautious pen of the historian, dipped in the bottle of the chill past, needs run fire. It is greater than words. Its stops and commas are the life and blood of a nation suddenly overwhelmed, brought bleeding and senseless to its knees, yet,

The Autumn Campaign in the Air

with the last breath choking from its cruelly shaken body, rising to immortality. But in the blaze of universal admiration, as glowing embers in the flame, are reflected those human weaknesses that go to make the body perfect. There is a fault, a deadly imperfection. The French airmen know not the meaning of fear; no objective, however difficult or dangerous, could quench their heroic determination. The fault does not lie in the spirit that is too willing, but is unconsciously hidden in the flesh that is only too weak. Their teamwork is not faultless; it savours too much of the individual and of the individualist.

It is a matter of temperament; another of those curiously fascinating psychological paradoxes of war. Patriotism to the German was something sublime, something above the grasp of his mentality, an intangible deity, unquestionable and demanding implicit obedience of action, thought and ideal. Subconsciously the Englishman frames his devotion in the single word "loyalty." Only through an intense and unusual comradeship does he realise the greater birthright of Empire, while to the Frenchman patriotism is an acute reality. France is of his whole body, mind and soul; it is himself. Paraphrased, one might say it was the German Kaiser, and it is "la Patrie," and the "Old Country."

To some extent this individual tendency was fostered in spirit by the practice of the French Army Command of specifically naming airmen for deeds in the field. The position of France in this matter, however, was peculiar. Of all nations France had given most sons to the cause of pre-war aviation. Many of them had already obtained world-wide fame, and, strangely enough, the majority had built up their reputations on British aviation fields. The French Air Service went to war a corps of "aces."

France's Experienced Air Force

In the earlier French dispatches appeared such names as those of Pégoud, Garros, Louis Noel, Gaubert, Salmét, Baudry, Verrier, and Conneau "Beaumont," all tried airmen of several years' standing and experience. Garros was soon accredited—incorrectly—with having rammed a Zeppelin that

The Great War in the Air

had flown across the French frontier. The great airship, it was said, came down to earth a total wreck, killing all of the crew, while, of course, Garros lost his life! After a brilliant affair in the neighbourhood of Mülhausen, Aubert was decorated with the Military Medal by General Pau in person. Aubert was flying close to Mülhausen, when the stoppage of his engine forced him to descend within rifle range. Fortunately at that moment his engine restarted, and he was able to reach the French lines. He had previously dropped all his grenades, and his machine was riddled with bullets. In the late autumn the famous airmen Pégoud and Finke flew 200 miles into German territory.

Another of these gallant "individuals" was a tall, fair, smooth-faced boy of eighteen summers, Corporal Edouard Leclere. Two months after the declaration of war Leclere had already brought down two German Taubes and flown over 5,000 miles on reconnaissance flights. On one occasion he ventured as far as Cologne; but his best performance occurred during a gale of wind. An officer commanding a battery had asked for an airman who could undertake reconnaissance work for a distance of seven miles over the enemy's lines. In view of the violent storm raging, was the reply of the Commander of the Air Corps, it was impossible for an airman to go up. But young Leclere chanced to overhear this. Without waiting for orders, he started off on his monoplane, located the German batteries, and came back with the desired intelligence. Ten minutes later the enemy's guns were put out of action by the French "seventy-fives."

Paulhan, who had already made a great reputation as a civilian pilot, and who was one of the first to volunteer for active service, was to enhance considerably that fame under the sterner realities of war. Paulhan's mechanic tells the story of his first war flight. After weathering an unusually bad spell of anti-aircraft fire and passing over a German aerodrome, an enemy aeroplane came in sight below them. Instantly they dropped to meet it, and the mechanic—officially turned gunner—aimed his quick-firer, bringing the German machine crashing to the ground. But when Paulhan attempted to "climb" back to his lines it was found that a bullet had pierced the

The Autumn Campaign in the Air

petrol tank and the engine was badly damaged. With great difficulty he managed to keep in the air till he was just within the French advanced lines. Seeing him descend, a squad of Uhlans attempted to rush the position. The gunner-mechanic, however, proved too quick for them. He opened rapid fire, and, with the aid of some French chasseurs, the attack was repulsed.

An Adventure of Vedrines

To his mechanic also we are indebted for the spirited account of an adventure that befell Vedrines:

"This morning while our convoy was leaving the town a German aeroplane flew over us," says this gentleman. "We fired on it but could not bring it down. Then M. Vedrines started off in a 180 h.p. monoplane and pursued it. M. Vedrines rose to a height of 6,000 feet and brought the Taube down with a mitrailleuse. This is the twenty-first German aeroplane destroyed, and the second brought down by M. Vedrines in the space of three days." Vedrines nicknamed his machine "La Vache" (the cow), the words being painted on the sides in great foot-deep letters. Every evening after a flight he and his mechanic made a practice of counting the number of bullet holes in the machine, marking each with a circle in red chalk so that none should be included in the next day's effort. These individual efforts were encouraged by the French High Command, as may be read in the following official:

"Details of a brilliant aeroplane action have been received here. Lieut. Roeckel, with Captain Simon as Staff observer, left Marville to reconnoitre the enemy's movements in the neighbourhood of Longwy, Arlon, and Virton. When 1,800 metres above Musson Wood, which is three kilos north-west of Longwy, an anti-aeroplane battery, guarding a German dirigible, opened fire upon them. A shell burst so near them that the machine was completely thrown off its balance. The motor stopped, and there began a giddy descent which, in spite of the furious efforts of the pilot, was only checked 200 metres from the ground. The pilot was determined rather than fall into the hands of the enemy to dash down amid the flames

The Great War in the Air

of Longwy citadel. A descent was finally contrived 300 metres south-west of Longwy, in advance of the French firing-line, which was withdrawing at the moment under heavy rifle and shell fire. Here, after an examination of the motor under a hail of shells and bullets, Lieut. Roeckel explained to the observer officer the method of starting the machine, and a quarter of an hour after both officers had returned to their posts."

CHAPTER IV

THE ROYAL NAVAL AIR SERVICE

Faulty Organisation—The Gigantic Problem of the R.N.A.S.—Struggle for the Belgian Coast—Raiding the German Submarine Bases—Airships and Seaplanes—Co-operation with the R.F.C.—The Air War on Germany begins—Cuxhaven and Friedrichshaven Raids.

WHILE it is not the aim of this work to criticise the acts, or the policy, or the organisation of any Government or corps, faced as they were with the sudden stress of armed conflict and with gigantic problems unequalled in any previous war, certain facts are much too apparent to be overlooked. It is not altogether with pride one can discuss the early organisation of the British Royal Naval Air Service. The Director of the Air Department (the D.A.D. as he was termed) at this time was an able but not a strong man. The Service itself, removed from the public gaze, was divided into two factions, those for and those against the D.A.D. Rightly or wrongly, the latter party, by certain acts of passive resistance, commenced to make their influence felt at the Admiralty, and, indeed, throughout the whole of the Naval Air Service. This influence at length became so strong that the Director left his command, and another was appointed in his stead. These conflicting underground influences had a bad effect upon a young and rapidly developing Service. Organisation was faulty. At one station there would be many trained pilots and no available machines; vice versa, at another would be more aircraft than could ever be employed in that area with no pilots to fly them. Thus developed a condition of unrest that struck hard at the moral of the corps and materially affected their discipline. For purposes of training there existed no properly equipped schools, and the curriculum was scrappy to a degree. Apparently flying was the only instruction considered by the Naval authorities as being essential to the

The Great War in the Air

education of a pilot; such vital necessities as map-reading, gunnery, wireless and photography were almost altogether overlooked.

For this condition of affairs, however, the Director, Commodore Murray Sueter, should not be blamed, but rather the policy of development that he countenanced. Old retired officers of flag rank from the fleet, who had not proved themselves the most excellent of sailors, were found jobs in high positions in a new and intricate Service that essentially necessitated sympathetic handling. Had these old "beachcombers" but gone to sea and permitted the more skilled, technical and younger men to stick to their desks, the early history of the R.N.A.S. would have made more pleasant reading. This may be realised by contrast with the more rapid and efficient development of the Royal Flying Corps, whose policy with regard to high commands was in direct opposition. The Admiralty deliberately entered the open market against the Army in the matter of the purchase of aeroplanes, engines and supplies, to the grave detriment of both Services. This may appear hard criticism, but, from an intimate knowledge of inside facts, it is more than justified.

The Difficulties of Naval Flying

It must be admitted, however, that, compared with the problem that confronted the R.F.C. on the outbreak of hostilities, that of the Naval Wing was immeasurably greater. The military were faced with the one enormous but straightforward problem of the supply of necessary aeroplanes and pilots. Aeroplanes, seaplanes, airships and kite-balloons were all included among the quota of the R.N.A.S. The Royal Naval Air Service had only been in existence for a little over a month when war broke out. On July 1, 1914, the Naval Wing became a separate Service. Three weeks later it made its appearance as such at a great Naval Test Mobilisation at Spithead, when all the available craft—a score of seaplanes—flew around the vessels of the Fleet. Within six weeks of its inception the R.N.A.S. found itself at war. The Service was called upon not merely to develop its material through unknown channels, but it was at the same time growing with

The Royal Naval Air Service

enormous speed as regards its personnel. Stations had to be flung up at express speed all over the country; new sources of manufacture and production had to be discovered and orders placed; new appointments had to be made, and, in addition, there was the delicate problem of the "direct entry" officer. Despite all of which the R.N.A.S. was not inactive in operation during the autumn of 1914. An Admiralty communiqué, published October 2, 1914, stated that:

"During the course of the war the Royal Naval Air Service (Naval Wing of Royal Flying Corps) has not been idle, airships, aeroplanes and seaplanes having proved their value in many undertakings.

"While the Expeditionary Force was being moved abroad a strong patrol to the eastward of the Straits of Dover was undertaken by both seaplanes and airships of the Naval Air Service. The airships remained steadily patrolling between the French and English coasts, sometimes for twelve hours on end; while farther to the east, with the assistance of the Belgian authorities, a temporary seaplane base was established at Ostend, and a patrol kept up with seaplanes between this place and the English coast opposite.

"By this means it was impossible for the enemy's ships to approach the Straits without being seen for very many miles.

"On one occasion, during one of the airship patrols, it became necessary to change a propeller blade of one of the engines. The captain feared it would be necessary to descend for this purpose, but two of the crew immediately volunteered to carry out this difficult task in the air, and, climbing out on to the bracket carrying the propeller shafting, they completed the hazardous work of changing the propeller's blade 2,000 feet above the sea.

"On August 27th, when Ostend was occupied by a force of marines, a strong squadron of aeroplanes, under Wing-Commander Samson, complete with all transport and equipment, was also sent over, the aeroplanes flying thither via Dover and Calais.

"Advanced bases have been established some distance inland, and on several occasions skirmishes have taken place between armed motor-car support and bands of Uhlans.

The Great War in the Air

"All these affairs have been successful, with loss to the enemy in killed and prisoners. The Naval armed cars and aeroplanes have also assisted French forces of artillery and infantry on several occasions."

The Strategic Wing

It may be seen from the above that the uses of naval aircraft in the war were already many and varied. The R.N.A.S. was the strategic wing of the Air Service. Offensive and defensive aerial patrols were likewise entrusted to the naval airmen. Their bases lay both ashore and afloat. Reconnaissance was but the minor purpose of the R.N.A.S., their principal work lay in bomb-raiding and destruction. Thereby an effect was produced on the enemy's moral, that is described in an official of this period: "The fact shows that, in the event of further bombs being dropped into Antwerp or other Belgian towns, measures of reprisal can certainly be adopted." Several R.N.A.S. squadrons, in addition, were told off to co-operate with the R.F.C., which they did most efficiently, being responsible for numerous successful raids on German territory, one such raid being described by "Eye-Witness":

"On Tuesday the chief event was a successful aerial raid carried out by us against Ghisteltes, some 12 miles to the west of Bruges. In spite of very misty weather and a certain amount of wind, our aeroplanes reached their destination about dawn and, flying very low, dropped several bombs on certain sheds which formed their objective. Exactly what damage was done it is not possible to state, but it is known to have been considerable.

"Friday was sunny, with some frost and not much wind; in fact, as perfect a day for aviation as can be expected at this time of year; and the Germans took advantage of the weather to make an aerial raid on a large scale against Dunkirk. The details are as follows: One of our aeroplanes—a single-seater—was on patrol duty, when the observer saw several hostile machines approaching. He at once gave chase to the first hostile machine and opened fire on it. Meanwhile two other British machines started from the ground. It took them some little time to ascend the height of 6,000 feet to where the action

The Royal Naval Air Service

in the air was proceeding, during which time the British machine that had been on patrol had succeeded in driving off with its fire the two leading German machines. Ten others, however, had come up by the time that the three British machines were all in action. After the Germans had dropped several bombs over the harbour and town the whole turned and flew back towards their lines. Our aeroplanes pursued, and brought down one German machine by a bullet through one of its cylinders. The aeroplane was captured, together with its pilot and observer and eight unexploded bombs. The observer was armed with a double-barrelled pistol for firing chain shot. In face of the heavy odds against them this feat on the part of our aviators was distinctly meritorious. The damage done by the raiders was slight." This flight was but typical of many. Generally speaking, the main objective of the R.N.A.S. was, at this time, the German positions along the Belgian coast.

The Struggle for the Belgian Coast

Almost every hour of the day and night, in fine weather and in storm, singly or in squadron, the naval craft, like hornets, were hovering over the patient, plodding German soldiery, whose business it was to build up along the Belgian coast from Ostend to Blankenberghe a naval front, more heavily defended, better situated for launching attacks—on the sea, under the sea, and over the sea—than even the impregnable German army positions in France and Flanders. By gaining control of that Belgian coast the enemy achieved his greatest victory of the war! Britain became faced with her greatest danger of the war. Here, within shell-range of her gates, lay the most warlike coast in the world, manned by a tireless and relentless enemy. The British Admiralty was not slow to appreciate the grave danger of that German-Belgian seaboard, that became at once the basic position for all the principal German air raids, torpedo-boat sorties and submarine attacks. Three months after the outbreak of hostilities Nieuport, Ostend and Zeebrugge were only accessible from the air. Thence commenced that long, grim Homeric struggle between the handful of British naval aircraft at Dunkirk and the whole

The Great War in the Air

array of Germany's armed might : guns, destroyers, submarines and aircraft.

"Observation is arranged from the shore by means of naval balloons," announced an Admiralty communiqué of October 22, 1914; "and all reports indicate that substantial losses have been inflicted upon the enemy, and that the fire is well directed and effective against his batteries and heavy guns." Another communiqué of October 24 stated, regarding the work of the naval guns at Nieuport and Ostend, that the naval aeroplanes and balloons aided in the direction of the fire. The great retirement along the Belgian coast, however, had not yet been forced upon our naval units.

After the débâcle of Antwerp, and in the dark days that followed, though farther inland, the R.N.A.S. was co-operating with the military wing in raids of great strategic importance; of the naval squadrons in North Flanders nothing was heard until the following January.

Raiding the German Submarine Bases

Late in that month, the 22nd, to be precise, the German took it into his head to send over 12 or 13 machines to raid Dunkirk. This squadron appeared over the town at about 11.30 A.M., and encountered a somewhat unfortunate surprise. Through those long, weary winter months it was popularly supposed that all naval aircraft had been withdrawn from the Belgian coast. As usual, popular fancy proved woefully at fault. The Admiralty, very wisely, had chosen this period of aerial inactivity to organise a combined sea and air campaign upon the German naval bases in Belgium on an unusually large scale. Off the shore monitors—which craft were specially designed for, and made their first appearance in, this action—were to bombard these positions from long range with their 12- and 15-inch guns; while the aircraft were to carry on a sort of guerrilla warfare from above. These plans were already well matured on the 22nd. Thus the German raiders chanced upon a hornet's nest unawares. Immediately they found themselves surrounded, and were engaged by Belgian, French and British naval and military aircraft. One of the Germans was brought down by a British military machine just

The Royal Naval Air Service

over the Belgian frontier, and the machine, pilot and observer captured.

From the date of this unprovoked attack on Dunkirk starts one of the most strenuous, and certainly the most vital, aerial campaigns of the whole war. Day in and day out the gallant Dunkirk pilots and observers never rested for five long and weary years. With the main German fleet bottled up, as Mr. Winston Churchill early remarked, "like rats in their holes," the entire enemy naval campaign rested upon the holding of this few score miles of seaboard at the toe of the North Sea. Thence set out the majority of their destroyer raids. From Zeebrugge and Ostend emanated the great U-boat campaign that was to throttle England's mercantile lines of supply and communication. Faced with this gigantic problem, and under the command of an Admiral who feared no foe, but developed a positive disinclination to risk one of his new monitors, the burden of this great responsibility heaped itself upon the willing shoulders of the pilots and observers of No. 1 Wing, R.N.A.S. The efficiency of their work in this respect is best judged by the wonderful results achieved.

The day following the German raid Squadron-Commander Richard Bell Davies—afterwards to be awarded both the V.C. and the D.S.O.—while reconnoitring the harbour works at Zeebrugge, found himself surrounded by seven German aeroplanes, but, by unusually skilful handling of his craft, managed to elude them. He was slightly wounded in the thigh during the engagement, but continued his flight, accomplished his mission, and the following day with another pilot dropped twenty-seven bombs on two submarines in the harbour, and on the guns along the Mole. One submarine was damaged considerably, and many casualties were caused among the guns' crews.

Those were indeed 'busy days with the naval pilots at Dunkirk, when the new, strange monitor-fleet crept out of harbour, up along the coast, ostensibly to commence the bombardment. For twenty-four hours, on February 11, incessant and combined aeroplane and seaplane operations were carried out in the Bruges, Zeebrugge, Blankenberghe and Ostend districts. Thirty-four naval aeroplanes and seaplanes

The Great War in the Air

took part. Though ostensibly to direct the guns of the naval craft at sea, their main objective was to hamper the development of, and if possible to demolish, the submarine bases. Ostend railway station, as a result of these attacks, was burnt to the ground; the railway station at Blankenberghe was damaged considerably, and railway lines were torn up in many places. During the attack Flight-Commander Grahame-White fell into the sea off Nieuport and was rescued by a French vessel.

Harrying Zeebrugge

Again the following afternoon 40 aeroplanes and seaplanes bombarded the heavy batteries situated on the east and west sides of Ostend harbour; the gun positions at Middelkerke; transport wagons on the Ostend-Ghistelles road; the locks and the Mole at Zeebrugge, to widen the breach damaged in former attacks; barges outside Blankenberghe, and trawlers outside Zeebrugge. It is very interesting to note, in the Admiralty official of these operations, a footnote that stated: "Instructions were always issued to confine the attacks to points of military importance, and every effort was made by the flying officers to avoid dropping bombs on any residential portion of the town."

Night and day, for weeks afterwards, in fine and stormy weather alike, British aeroplanes were hovering over Zeebrugge, defying the German guns on the pier, dodging showers of shrapnel, seeking an opportunity to bomb the submarines lying in the inner harbour. One night an English machine appeared over the town and, defying the concentrated fire, made a sudden dive to 300 feet from the ground, and coolly dropped his bombs at short range on a submarine moored in the Mole. There was a terrific explosion. The submarine was sunk, but the airman got safely away. At Blankenberghe sixteen soldiers were killed and many wounded. At Zeebrugge another submarine was severely damaged, while several batteries along the coast to the south of the town were badly damaged. An extraordinary number of bombs were dropped on the coast batteries between Knocke and Zeebrugge, and a great number of the guns were destroyed. On a certain morning in late February, at about 8.30, ten aeroplanes passed high over Dunkirk, coming from the west, and proceeded to Belgium via

The Royal Naval Air Service

the coast. "These were British machines," runs a *Daily Mail* account, "which had flown direct from England, and they were soon lost in the clouds. An hour later, however, all the aeroplanes were back again, as they had met heavy snowclouds and only three or four had been able to carry out their mission. The raid was therefore postponed until night, and at 10 P.M. a second start was made. A methodical bombardment of Zeebrugge was then begun. Each of the waterplanes in turn rose from the sea, dashed into Zeebrugge, dropped its bombs, and returned to the base at sea. As soon as one machine returned another left, and thus seventeen consecutive visits were paid to Zeebrugge. While this was going on from the sea, British and French aeroplanes left the aerodrome on land and completed the work of their waterplane comrades.

"On Friday a further raid was carried out. The entire fleet of waterplanes and the full fleet of British biplanes and French monoplanes took the air together and started all over the German positions in Flanders. Some went as far as Zeebrugge again, while others visited Ostend and Blankenberghe. One hundred and forty bombs, of which thirty were very large, were dropped on various ammunition and food depôts. The extent of the damage done is not known, but there were German submarines at Zeebrugge, while the Ostend railway station, which was set on fire, was still burning this afternoon when some French airmen made a reconnaissance as far as Ostend."

The Results of the Early Raids

These results are, for the most part, not drawn from deduction, but are confirmed by reports in neutral papers; even by the German Press and the enemy official wireless communiqués. A Sluis correspondent of the *Telegraaf*, for instance, reported of one British raid that a bomb struck a tramway car at Blankenberghe, killing 8 German soldiers and wounding 50 others. The combined seaplane and aeroplane raid of February 11 was confirmed by a Rotterdam correspondent, who stated that two Belgian trawlers which were being used for mine-laying were sunk and a section of the Zeebrugge railway was destroyed. Another Rotterdam witness of the following day's aerial attack stated emphatically that it had even more

The Great War in the Air

valuable results than was indicated in official messages. In addition to damage to the coastal positions, the bombs played havoc with the German lines of communication; while in the German "wireless" of February 15 appeared the following :

"Of late repeated attempts have been made by French and English aviators to proceed as far as Brussels. The day before yesterday an English flying machine again approached the town, presumably with the intention of bombarding the German camp near Brussels. As soon as the Englishmen came into view a German Taube went up and a fierce fight commenced, which ended with the victory of the German flying machine. The English machine suddenly crashed to the ground in a straight line. The two occupants were dead.

"In the western theatre of the war enemy aviators again dropped bombs on the coast yesterday, by which bombs regrettable damage was caused to the civil population and their possessions, while from the military point of view we suffered only slight losses."

Seaplanes and Airships

Far off the shore, hovering over mine-fields in the midst of the North Sea, patrolling the British coast for German submarines; away to the north as far as Scapa Flow, to the south from Beachy Head to the Lizard, convoying British troopships across Channel, the R.N.A.S. airships and seaplanes were playing their part in the great war in the air. The airships, at this time, were a mere handful of out-of-date craft, handed over from the Army to the R.N. only a few months before the outbreak of war, and not worthy of being taken into account. British seaplanes, however, were most practical and efficient, and Britain the first seaplane power of the world. Units were loaned to the French, afterward to the Italian, and yet later to the American navies. Up to the early months of 1918, seaplanes were employed on every sea-front, from the Orkneys to the Suez Canal, to Mesopotamia, and down to the shores of British East Africa. There were two different and distinct types of craft: the twin-float, fitted with two small hydroplane-shaped floats attached to the undercarriage to take the place of landing-wheels, with the fuselage built somewhat

The Royal Naval Air Service

after the lines of a land machine, containing the engine, and pilot's and observer's seats; this type was employed exclusively afloat, for work with the fleet. While the "boat," fitted with a boat-shape cabin, centrally placed below the wings, that contained the engine, crew, bombs and machine-guns, worked from shore bases. In the light of these few facts, then, it is all the more extraordinary that the R.N.A.S., a Service primarily established for co-operation with the Navy, should figure most prominently in the first year of the war as a land aerial force. And, working with the pilots and observers of the R.F.C., we find that the Air Service was responsible for the most important and extensive aerial operations ashore in the first twelve months of war.

The Air War on Germany Begins

The details of the first of two air-raids of any consequence that were made in the early part of the war, and that brought to the German civil population their first taste of real warfare, are shrouded by two terse official statements, British and German respectively. Said the Admiralty, October 9, 1914: "Squadron-Commander D. A. Spencer Grey, R.N., reports that as authorised he carried out, with Lieut. R. L. G. Marix and Lieut. S. V. Sippe, a successful attack on the Düsseldorf airship shed. Lieut. Marix's bombs, dropped from 500 ft., hit the shed, went through the roof, and destroyed a Zeppelin. Flames were observed 500 ft. high, the result of igniting the gas of an airship. All three officers are safe, but their aeroplanes have been lost. The feat would appear to be in every respect remarkable, having regard to the distance—over a hundred miles—penetrated into country held by the enemy, and to the fact that a previous attack had put the enemy on their guard and enabled them to mount anti-aircraft guns."

The Germans, the following day, added to this information that: "One of the enemy's aeroplanes dropped bombs near the Düsseldorf airship shed, but no damage was done."

The dawn of a clear, windless day was breaking across the Belgian aerodrome as the daring British airmen—no Belgian pilots participated, as has elsewhere been erroneously stated—set out upon this remarkable expedition, wherein all their

The Great War in the Air

machines were to be lost. The raid was, in fact, to encounter unusually stiff opposition all the way along. The number of untoward and alarming incidents that occurred during those two breathless hours was altogether beyond precedent. Barely twenty minutes had elapsed before one of the machines plunged down out of formation to the earth, with a failing engine. "I soon found that I was on Belgian soil," says this aviator, "for a cheery Belgian woman ran up and asked if I had had my *déjeuner*. On examining my machine I found that the mechanic had been so anxious that I should get the greatest power out of the engine that he had put so much compression into the tank that the tank had burst. I was consequently unable to continue my second flight to Düsseldorf."

Meanwhile, as the remainder of the squadron had reached their prearranged rendezvous, they divided into two parties. One party went on to attack the Zeppelin sheds at Düsseldorf, the other to bomb the hangars at Cologne. Again misfortune dogged their speeding wings. As far as the river Meuse the weather continued clear and favourable, but after the Meuse fog was encountered. The section having Cologne as their objective reached the city to find it enveloped in a thick fog. For an hour and a half the aviators circled round, afraid to discharge bombs at random for fear of damaging civilians, houses, or churches, but utterly unable to distinguish the Zeppelin hangars. Finally this woebegone flight was obliged to turn back, having failed in its mission, and not having discharged any bombs.

However, while these events were untoward, Squadron-Commander Spencer Grey and Lieut. Marix proceeded merrily on their way to Düsseldorf. Once over the city, the two airmen were received by a heavy fire, notwithstanding which they came down low and dropped their bombs with splendid accuracy. Of the result there is no possible doubt. The shed was destroyed, with at least one Zeppelin inside it. Grey's machine was struck, but he was able to bring it back to Antwerp. It was not possible, however, to preserve it as a memento of the raid, for during the siege the aerodrome was shelled and the plane was destroyed. Marix came in for much more attention from the German gunners and riflemen than Grey. His aeroplane

The Royal Naval Air Service

was struck twenty times, and two of his control wires were cut, yet he managed, with great skill, to get over the frontier, and did not descend till he was within fifteen miles of Antwerp. He had to abandon the machine, but was himself picked up by a naval armoured motor-car, and was brought back safely to the base, to be heartily congratulated by his fellow-pilots.

Connected with the second of these great raids—that on Friedrichshaven—is one of the most thrilling personal incidents of the war in the air. It is, to all intents and purposes, a one-man story.

The Story of Squadron-Commander Briggs

All the world must remember the story of the capture of Squadron-Commander Briggs, R.N., November 21, 1914. England and France seethed with indignation at the account of his treatment at the hands of his brutal captors, published six days later in the *Matin*. And again memorable was his personal denial of this account, forwarded to the British Government by way of the American Embassy in London, and Mr. Gerard, the United States ambassador to Berlin. This was contained in a dossier "read, approved, and signed" by the Squadron-Commander, and ran: "I received orders to attack the Zeppelin works at Friedrichshaven. In execution of this commission I found myself, on November 21, 1914, in my two-seated biplane, without a passenger, above the Zeppelin halls at Friedrichshaven. At a height of about 100 metres above these works my petrol tank was holed, which forced me to land. I also got a light, grazing shot, causing a slight wound over the right ear, which bled. I had to descend quite near the sheds.

"I landed without damage on the level ground adjoining the sheds. After the landing my biplane remained on the level ground. Immediately after the landing a German soldier, at a distance of about 40 metres, fired five rounds at me, but did not hit me; I then lifted up my hands, and several persons, both military and civilian, came up to me as I sat strapped in the biplane. I was released from my belt, and was then dragged out. During this latter operation the top part of my body was bent forward with my face looking downwards toward

The Great War in the Air

the ground. In this position I received a heavy blow on the crown of my head, which I strongly felt through my flying-cap. This blow did not cause insensibility or bleeding. I presume that the blow which was given me with such strength was administered by the butt of a rifle. This blow had been delivered presumably by a soldier of the rank, as I had seen only such carrying rifles. To judge by the sword, and in consequence of what I was told subsequently, there was a German officer amongst the crowd who rushed towards me. The last time I remember seeing this person he was at about a distance of 40 metres from me.

"As I had been entirely dragged out from the biplane, and stood on my legs again, I was placed between two soldiers, who held me by each arm. At my back there was an excited crowd, who apparently wanted to rush on me. I was led immediately by the soldiers to the guardhouse, situated a few minutes' walk away. I remained in the guardhouse about half an hour, and an English-speaking German here gave me water to drink. This English-speaking German and two soldiers took me subsequently to the hospital at Friedrichshaven in a motor-car.

"This former visited me the following day at the hospital, and took the opportunity of telling me that the officer who was coming along when I landed probably saved my life. He also informed me that this officer stood between me and the crowd after I had been dragged out of the biplane, and threatened to shoot anyone who would lay hands on me. I have had read to me a publication in the *Matin*, dated November 27, 1914, which contained the following words:

"'It is considered to be the height of cowardice that a German officer flogged (drawing blood) the shot-down aviator, Edward Briggs.'

"To this I declare that neither the German officer who was present at the landing, nor any other German officer, has laid hands on me, not to mention flogging me with a horsewhip, since I was dragged out of the biplane.

"Previously I had received only a single blow, namely, that one mentioned above, which was presumably made by the rifle butt; as a matter of fact, I did not see who administered the

The Royal Naval Air Service

blow, as at this time I was being dragged out of the biplane with my face towards the ground. But I declare once more that, in view of the reasons above-mentioned, it is quite improbable that an officer administered this blow, besides which it is my personal opinion that a German officer would consider such an act as stated in the *Matin* beneath his dignity, as would an English officer."

CHAPTER V

FROM YPRES TO GIVENCHY

The Value of the Military Observer—The Development of Aerial Combat—The Psychology of the Air—Aircraft in the First Great Battle of Ypres—The Reaction—The Last Tribute of the R.F.C. to Lord Roberts—Development in Military Aviation in General—Moral and Military Results of Air-Raids—The Gurkhas and German Aerial Propaganda—French Aerial Defences.

WHILE the war was yet very young, it was discovered that the aviator was a fighting man of a race apart. He was as different from the artillery, infantry, or cavalry man as is a sailor from a soldier. In most respects he resembled the former rather than the latter. He set out, and returned to—if the Fates were lenient—a specified harbour. A neutral element was his field of endeavour, and he flew a craft, with port and starboard sides, by compass. In action his manœuvres were those of a miniature battleship—later he was to go into battle in squadron and in line. As the war developed, it was discovered that the genus airman was subdivided, naturally, into classes. The pre-war professional specialist, imbued with a smattering of military discipline and tradition, became automatically the expert wireless operator or photographer. The first-rate aerial fighting man was, like a good batsman, born to his art; no amount of training could enable him to achieve that “fey” premonition of an enemy’s movements that was the subconscious sixth sense of the “ace.” And a man with a rapid eye, a sense of detail, a sound judgment, became, as though by instinct, an observer.

British observers soon proved themselves amazingly efficient. They seemed to have a natural eye for country, and to pick out a movement on the enemy’s part in a manner suggestive of a stalker picking out a stag on a hill which he has known from childhood. This specific gift is well described

From Ypres to Givenchy

by the official Eye-Witness at British G.H.Q. "The temperament of the observer," he says, "is of the greatest importance. He must be cool and capable of great concentration in order to keep his attention fixed upon his objective in spite of all distractions—such as, for instance, the bursts of shell close to him, or the noise of rifle bullets passing through the planes of his machine. He must withstand the temptation to make conjectures, or to think that he has seen something when he is not absolutely certain of the fact, since an error in observing or an inaccuracy in reporting may lead to false conclusions, and cause infinite harm.

"The really first-rate observer must possess extensive military knowledge, in order to know what objects to look for and where to look for them; he must have very good eyesight in order to pick them up, and he must have the knack of reading a map quickly, both in order to mark correctly their positions and to find his way. To reconnoitre is not easy even in fine weather; but in driving rain or snow, in a temperature perhaps several degrees below zero, or in a gale, where an aeroplane travelling with the wind rocks and sways like a ship in a heavy sea and may attain a speed of one hundred and fifty miles an hour, the difficulties are immense. In these circumstances, and from the altitude at which it is necessary to fly in order to escape the projectiles of anti-aircraft guns, columns of transport or of men are easily missed. Indeed, at a first attempt, an observer will see nothing which is of military value, for it is only after considerable practice that the eye becomes accustomed to scouring a great stretch of country from above and acquires the power of distinguishing objects upon it."

The Development of the R.F.C.

This somewhat lengthy account may at first sight appear to be digressive to the main theme of this History. It is, however, more than justified by the immediate developments of the R.F.C. The observer was at this time, and for many months ahead, the "man" in the air. In the first great crisis of the battle of Ypres (October 21, 1914) he was to prove almost the deciding factor; influencing the course of the battle at every vital stage, from the repulse of the German massed attack at

The Great War in the Air

La Bassée (October 22) to the second enemy attack, two days later, across the Yser, and also the desperate hand-to-hand fighting at Kruiseek. But even before Ypres, in the long blue autumn days of late 1914, he became more and more the nightmare of the German army commanders.

The difficulty and dangers of the work of these observers were enormous. According to a newspaper account, one British reconnaissance plane, in the early days of the war, was brought crashing to the ground, as the occupants had been overcome and choked with the fumes of a German gas-shell, that created "a strange rainbow effect in the bursting shell-cloud—green, yellow, and even black, beside the ordinary white. And on coming to earth our flyers have complained of a dizziness and sickness." At the moment the British airman was the most criticised and handicapped unit in the field. A mistake by him was so vital. As if dozens of shells bursting around him, and thousands of bullets whizzing by, were not enough to put him off his work, the enemy commenced to pester him with new-fangled anti-aircraft devices. As said one of these unfortunate observers: "The most trying part of our work is something that would never occur to the layman. We don't mind the chances of a bullet hitting us. A fight with an enemy's aeroplane is fine sport, and the Germans cannot lick us at that. But when they get their high-angle guns at work on us the disturbance of the air is so great that it is as much as ever you can do to control your machine. It plunges up and down and rolls sideways so that, do what you will, it nearly turns over. You hardly know whether you are upside down or not. I've been in plenty of bad weather at sea, and it's worse than anything I ever suffered in a boat. It makes me downright sick; just like a bad attack of sea-sickness."

This, however, was but one of many adventures that lay in wait for the unwary aerial observer. Encounters with enemy aircraft were not infrequent. One such was reported by a *Daily Mail* correspondent, in late October:

"Another air-fight, very characteristic of the fighting qualities of the British, and indeed German, airmen occurred in recent fighting round Ypres. Two British aeroplanes went in pursuit of a Taube that was both reconnoitring and throw-

From Ypres to Givenchy

ing bombs. Our men were armed with carbines and saloon pistols. After some manoeuvring they succeeded in putting a bullet through the petrol tank of the Taube. In spite of this the Germans managed to plane successfully to the ground, and leaving their machine they ran to a wood some two miles off. The hue and cry was raised, and fifty or more British and Belgians hurried to the search. The game of hide-and-seek lasted long, but after an hour or so a Belgian soldier spied the foot of one of the Germans who had wriggled up a drain. The other man also was captured a few minutes later. Both men wore the Iron Cross, and the captors were very disappointed at not being allowed to take them as mementoes. 'He burned my house down at Liège; why shouldn't I have his Iron Cross?' was the Belgian argument. The two airmen, who were very fine men, had one consolation in captivity—they would be able to grow some hair. When taken their heads were shaved as bald as a razor could make them."

Aerial Combat

The precarious nature of the work of reconnaissance planes, naturally enough, very soon necessitated some sort of armed escort. This was supplied by faster fighting-scouts. Again, both sides made renewed attempts to drive the reconnoitring aeroplanes from the neighbourhood of the lines and vital positions. The first step had been taken towards the development of aerial combat, and British airmen soon excelled, beyond imagination, as fighting pilots.

Five German machines had been brought down by the Royal Flying Corps by September 11, 1914. Every British airman was ordered immediately to attack enemy aircraft on sight. And the effects of such methods may be judged by an excerpt of an official Press Bureau message of October 2, which stated: "The hostile fire has decreased both in control and direction . . . the direct result of the activity of our aircraft, and their interference with the enemy's air reconnaissance and observation of fire." And again by a statement published in Sir John French's dispatch: "The enemy have recently become much less enterprising in their flight. Something in the direction of the mastery of the air has already been gained."

The Great War in the Air

As the British scouts went incessantly speeding over the German lines, it is not to be wondered at, however, that they met with ever-increasing resistance. Battles in the air became more frequent day after day, and one of the earliest of these resulted in an unusually exciting encounter in mid-air. A British airman, in a fast scouting aeroplane, sighted a hostile machine. He had two rifles fixed, one on either side of his engine, and at once gave chase, but lost sight of his opponent among some clouds. Soon, however, another machine hove into view, which turned out to be a German Otto biplane—a type of machine which is not nearly so fast as the British scouts. The British officer once again started in pursuit. He knew that, owing to the position of the propeller on the hostile machine, he could not be fired at when astern of his opponent. At sixty yards' range he fired one rifle without apparent result; then, as his pace was carrying him ahead of his quarry, he turned round and, again coming to about the same distance behind, emptied his magazine at the German. The latter began at once to descend as if either he or his machine were hit. Shutting off his engine and volplaning to free his hands, the pursuer recharged his magazine. Unfortunately it jammed, but he managed to insert four cartridges and to fire them at his descending opponent, who disappeared into a bank of cloud with dramatic suddenness. When the British officer emerged below the clouds he could see no sign of the other. He therefore climbed up to an altitude of some 7,000 ft., and came to the conclusion that the German must have come to earth in the French lines.

The Psychology of the Air

In this account one is struck particularly by the fact that both German machines attempted to evade combat. This is not a solitary instance of similar German conduct in mid-air. Time and again, about this period, the student may discover in accounts, both official and semi-official, cases of enemy aviators taking to their heels rather than come to blows with British airmen. The truth of the matter is that the Germans were already painfully confused by the unexpected and stubborn resistance put up by the tiny British R.F.C. If their plans for

From Ypres to Givenchy

an immediate and overwhelming victory on the Western Front and against the British Grand Fleet had been sadly at fault, the aerial autumn campaign was to prove nothing short of a disaster. Again it was a matter of psychology. And though psychology has previously been dealt with in this volume, the writer may be pardoned in view of the fact that the human is, and must be, the predominant factor in the air.

The man is the machine; never the machine the man! This fact was early recognised by the British aerial authorities. Personality and temperament were nothing to the autocrats of discipline at Potsdam. A heaven-born gift was the sympathetic understanding of the Flying Corps chiefs, who refused to hammer square pegs into round holes. The man had perforce to work out his own destiny; an aptitude for combat was encouraged in every way; the slower, less brilliant pilot, after a few preliminary tests, was always selected for the less trying work of reconnaissance and the direction of artillery fire. The wisdom of this policy was to manifest itself in the great struggle of the immediate future.

There are two methods of organising a strong army of first-class aerial fighters. Like fitting out a schoolboy at an outfitter's, the High Command can mobilise its best brains for construction and design; the result of their combined effort being a machine without imperfection. Properly equipped and staffed with the most skilful workmen, this machine, standardised in every part, can be turned out by the factories by the thousand yearly. A strategic distribution of aerodromes and of supply bases gives those craft a wellnigh perfect medium for distribution. But what of the man? An ideal system has been evolved; but unless the value of that system is to be seriously endangered, the pilot and the observer must fall in with the system as mere units. With the British, on the other hand, the man was the initial factor; supply, design, manufacture, and distribution, the units. The British airman found the system developed to meet his latest requirements; not the system the man. In those early months the struggle for the air proceeded between the highly scientific German aeroplane construction and an indomitable British human element that knew not defeat. For four long, grim, and bloody weeks

The Great War in the Air

of the first great battle of Ypres that desperate struggle was to be fought out, and the man came through the ordeal with flying colours. The British airman was master of the situation from the first to the last day of the battle.

From the first massed advance of the German infantry the R.F.C. were incessantly hovering overhead, spying out the weak spots in the enemy line. Immediately his great guns came toiling up within range the British "heavies" would be crashing out in a counter-battery burst, directed by aircraft immediately over the vicinity of the target. At the highly critical moment of the withdrawal of the British line (October 27, 1914) the enemy's reconnaissance craft were so cleverly hustled from the air that the Germans were not aware of our retreat until too late to be of any use to them. And when the French drove in at the psychological moment with their counter-attack it was again the British aircraft that directed so remorselessly the Allied bombardment upon the enemy's positions chock-a-block with panic-stricken field-greys. A day's work with the Flying Corps in those black days of 1914 almost passes description. As they came toiling homewards at sunset-time those weary pilots with their sadly battered machines presented one of the most pathetic and inspiring sights of the war. One by one, from various points, the aeroplanes return to their quarters like homing pigeons. Soon the whole squadron is there, and while pilots and observers go to headquarters to make their reports the mechanics see to the machines. Suddenly the sound of a motor is heard, and all eyes turn to scan the sky. A black spot shows against the grey clouds. No, it is not a Prussian but a British aeroplane, and the pilot brings some very important news. A German convoy is advancing along a little branch line some thirty miles away. Immediately the air-camp is full of bustle.

In less than a quarter of an hour the whole squadron is up and off, flying in single file. Suddenly, before the pilot has been able to make out precisely what is beneath him, a flame rises from the ground, and a great wave of air rocks the machine. The bomb dropped by the leading aeroplane must have hit something. We cut off the motor and descend. The aeroplane in front of us has just made the same manœuvre and

From Ypres to Givenchy

has dropped its bombs, to judge by the columns of thick smoke that arise here and there. It will be our turn soon.

Still we descend. And now we can distinguish what is going on beneath. An engine is lying on its side, a great hole torn in its flank, and behind it is the black, confused mass of a convoy, from which flames and smoke are pouring. The aim has been true. A little farther on, when the smoke blows momentarily aside, we see another convoy in flight. We switch on our motor, overtake it, aim, and drop our bombs. No time to watch their effect. If we have missed we must leave it to those who follow to do better. We still have work to do. In front of us lies a village, from whose houses issue little dark specks in hundreds, as from a disturbed ant-hill. We drop more bombs, and this time we are sure we have not missed. Columns of smoke rise up, the movement among the dark specks becomes more marked, and great billows of air cause our machine to roll like a boat in a high sea.

Now the leader of the squadron signals to us to return. Regretfully, and dropping our last projectiles, we sweep round and make for home, amid a hail of ineffective bullets. Below us the convoys are burning still, throwing out yellow tongues of flame into the gathering darkness. Far away in the horizon we can see the friendly flicker of the lights that denote our landing-place. The day's work is over, a good day's work and a typical. There will be many a German battery that will wait in vain for the promised and sorely-needed munitions.

And what lies behind that day's work? Such a galaxy of inspiring adventures and desperate enterprises as no man could ever have imagined in those idle, easy pre-war days of 1914. Britain has indeed found her soul again in the air. One day, early in the battle, it will be an account in a newspaper, the *Daily Mail*: "Our airmen are ready at a moment's notice, and many duels are reported. An encounter took place during the week, when once again the Taubes came off second best. It was at — while fighting was in progress. Apparently the Germans had organised a raid upon —. There was a clear blue sky, and signals were received that four Taubes were heading towards the Allies. Instantly two British and two French aeroplanes took the air. It was a sight never to be

The Great War in the Air

forgotten. The two French appeared to be carrying machine-guns. The eight manœuvred for positions. First up, then down, a long sweeping circle and back again. The Allies are in a favourable position, now the Germans are. Suddenly a signal comes from below. It is a clever manœuvre: the Allies have enticed their opponents into a favourable position for our guns, and on the signal being given have turned away and are gliding to earth. Realising their perilous position, the Taubes make as if to ascend, but too late; shells are bursting around them, they collapse and dash to the ground a mass of flame. Not one escaped—the four were accounted for."

Sunshine and Storm in 1914

Another day it will be: "The wind dropped, and within a short time aeroplanes began to dot the sky. The Germans were first into their machines. Four Taubes approached the Allied lines at a great height, and were soon opposed by two French and two English machines. A thrilling battle ensued which, although not by any means the first aerial combat of the war, was the most stirring event in the day's fighting. The eight pilots approached one another, then swept round in circles, rose and descended, rose and encircled one another again with the object of gaining an advantage. For ten minutes these evolutions continued, whilst the eyes of all the fighting men of both armies below were centred on them. Mitrailleuses cracked in all directions, but with no success. Suddenly the Allied aeroplanes flew from the fight. They flew in parallel lines one over the other, and the Germans pursued them at a tremendous speed. Too late the pursuers realised their danger. Literally a shower of shells from some hidden French batteries exploded around them. They had been enticed into a trap. Within another five minutes all four enemy machines were shattered. They fell in front of the English lines. Their officers and pilots—eight men—were killed instantaneously. Our own machines then volplaned to the ground, having accomplished their work with as much skill as luck." Shortly afterwards, as the fortune of the elements always favoured the enemy in those early years of the war, came rain, and wind, and storm.

From Ypres to Givenchy

For ten whole days previous to November 16 the weather rendered aerial reconnaissance impossible. It was either so misty that nothing could be seen or so windy as to interfere with flying. There was also a good deal of rain, which added materially to the discomforts of active service. On one day in particular (November 15) the weather was the worst yet experienced. It was bitterly cold, and rain fell in torrents. Nevertheless, in spite of all difficulties, British aviators carried out a successful reconnaissance. For some time they hovered over the German lines, observing the emplacements of batteries and searching the roads for hostile columns in the midst of a storm of driving snow and sleet which was encountered at high altitudes. Then the winter set in in earnest. Snow and slush succeeded frost, that again evaporated in mist and drizzle. All aerial work was temporarily suspended, and men and machines had a much needed rest.

The Salute to Lord Roberts

In this sad spell of inactivity, meanwhile, had occurred one of the most pathetic incidents of the whole war. Lord Roberts, the veteran field-marshal, early in November paid an official visit to the British Expeditionary Force. On the 11th he inspected the Royal Flying Corps, in whose work he had already evinced the liveliest interest. Within a week he was dead. And in the official account of the funeral service was the following tribute to the great soldier paid by the R.F.C. : "At this moment a fresh sound was heard above the roar of the artillery and the brassy music of the trumpets as a British aeroplane, one of the aerial guard that had been watching and protecting the procession, swooped up into sight, circled the square, and dipped in salute."

The work performed by the British military aviators during this trying period is best summed up in Sir John French's own words (November 20): "They have continued to prove of the utmost value to the success of the operations. Almost every day new methods for employing them, both strategically and tactically, are discovered and put into practice. The development of their use and employment has indeed been quite extraordinary, and I feel sure that no effort should be spared

The Great War in the Air

to increase their numbers and perfect their equipment and efficiency."

After such a strenuous period the expected reaction, strangely enough, did not occur. The R.F.C. went on from one enterprise to another, each more daring and amazing than the last. Staleness was the only woe outside their category; they took to aerial adventure as though it were second nature. In one case a British pilot attacked a German single-handed. With the inexperience of early war, he attempted to bomb him in mid-air—an impossibility! The bomb proved a fraction of a second too late. Meanwhile the enemy observer got to work with his improvised but deadly machine-gun. As his pilot manœuvred under the British machine he turned and fired upward, striking the pilot with a bullet. Terribly wounded, the British aviator still kept control of his machine. With grim courage he planed down, alighting close to his own ambulance. He lived, but it was a long time before he took to the air again.

Came a period of wind and storm, followed again by bright days of sunshine and renewed activity. A Sunday, November 26th, proved far from a day of rest in the air. Two more German aeroplanes were brought down; one was chased by a British machine for some distance, during which a running fight was kept up in which the Britisher was slightly wounded in the hand. He shot the enemy machine down, nevertheless, and when they landed the German pilot and observer appeared to be much surprised and disgusted to discover where they had descended. The officer who succeeded in forcing down this hostile machine had previously flown over Lille, where he had dropped several bombs on the aerodrome. The other aeroplane was also chased and forced to descend, but managed to do so inside the German lines.

The men of the Flying Corps were by now working into their game with all the zest and enthusiasm of a professional football or a baseball team. "Finer looking men than these British airmen I have never seen," said a French visitor to a British aerodrome. "Well set-up and tanned to a deep bronze, they are the personification of soldierly efficiency grafted on British physique. In command is —, who holds the English

From Ypres to Givenchy

record for long distance, and he may well be proud of his corps."

When not actually in the air the R.F.C. spent all their spare time in keeping fit, with gruelling games of whatsoever sport happened to be in season. The weather might be impossible for flying, but never so for useful exercise. They had plenty of time to get fit in those long, bleak winter days; while, as they paused, their first cousins, the anti-aircraft gunners and the machine-gun experts, would be lovingly occupied in experimenting with and the development of their toys. The A.-A. guns were already making fairly accurate shooting up to a vertical range of 8,000 feet, to say nothing of the remarkable development in accuracy that was being achieved with the fire of the aerial machine-gun. Bomb-dropping also was making remarkable progress. The bomb was launched at what might be termed a muzzle velocity of anything from forty to seventy miles an hour. The great problem then developed: How far forward would the bomb travel in still air from thousands of feet in altitude when dropped at a fixed rate of forward motion? This was the kind of question that the airmen were already beginning to answer for themselves. Many of the latest bombs had only missed their mark by about 30 yards, which in these things was a narrow margin, and there were even some "targets" recorded. However, there were many failures. One of the bombs near Hazebrouck, for example, both missed its mark and failed to explode, but became an object of terror to the gardener in whose patch it lay, until the British Military Authorities appeared with an electric detonating apparatus and gave an exhibition explosion.

Military and Moral Results

Reconnaissance could be little developed during the winter months, for it was always influenced to an irremediable extent by adverse weather conditions; but a low-flying layer of clouds may not be such a disadvantage to errands of destruction. It might be thick enough to prevent the observation and identification of comparatively small objects such as those whose presence it is usually sought to discover, but not to hide the features of the country, such as towns, villages and rivers, and so prevent

The Great War in the Air

an aviator orientating himself by sight. When this is so he can fly above the cloud-bank until he arrives over the point which he wishes to attack, and then drop his bombs unseen from below. Or he can descend and drop them from a lower altitude. It is easier to discern large objects on the ground through cloud than it is for those below to see an aeroplane through the same. The moral effect of "bolts from the blue," or rather from the blank grey, is somewhat greater than when the destroyer is actually seen.

It will be seen that by the middle of winter 1914-15 the belligerents were beginning to discern the fine distinction which lies between the military and moral results achieved by aircraft work. The enemy seized upon the latter with avidity. The aeroplane, the German discovered, was the finest propaganda machine that had ever existed. The British Indian troops were the first innocent cause of such solicitude on the part of the German General Staff, who commenced to take a more than fatherly interest in them. A bold attempt was made to wean them from their loyal allegiance to their Emperor. A new military biplane appeared high up over their trenches, flying slowly. It was out of range, and so no shots were fired. It flew on and over the Indians, went on a mile or two and, sweeping round, flew back. Just before it reached the rear lines it began to drop, and it was seen that the engine had stopped. To the amazement of the British troops it planed rapidly down and came to earth in their lines. The machine was captured and the pilot and his observer taken prisoners. A leaking petrol tank had been their undoing. Then it was found that the hull was loaded with pamphlets and leaflets, bearing the most fervid admonitions to the Indians, printed in excellent Hindustani. How the Indians repaid these kindly attentions is, however, another story.

It was a clever and a daring subterfuge. A British biplane was sent up and circled high over the enemy position. Instantly every anti-aircraft and machine-gun within—and without—range opened fire upon it. The uproar was deafening. Despite the fact that the machine was well some few thousand feet beyond the range of their rifles two entire front-line trenches commenced to volley it wildly. The aeroplane soared

From Ypres to Givenchy

complacently over the eruption and kept all eyes on itself. This was the Indians' opportunity. While every German head was turned and every neck craned to see the aeroplane, out crept the little brown men, the lithe grinning Gurkhas who had struck such terror into the German hearts. The distance between the lines was short, and before the sky-gazers had realised it a chuckling dusky wave of eel-like bodies was on them—on them, through them, and driving them out neatly and expeditiously. The Gurkhas did these things extremely dexterously.

Almost at the time of this friendly little sortie a most interesting domestic incident was reported in Eye-Witness's official account. H.M. King George was making a visit to the British lines in France and Belgium. And the last visit paid was to the headquarters of the Royal Flying Corps, where, as in other places, the normal routine was kept up. His Majesty addressed the officers and men of the Corps. Machines were being overhauled and repaired in the workshops, while on the aerodrome others were starting out on reconnaissance duty or returning. The King inspected one of the captured aeroplanes and witnessed some special flights, showing the same keen interest in military aviation that he had always evinced.

Christmas Day, 1914

From this time until the New Year there followed the longest period of aerial inactivity yet known in the war. It culminated with a thick fog that suddenly settled down over Flanders on Christmas Day, 1914.

The Christmas Day fog itself had the most weird effect. All the battling aeroplanes were completely immobilised in the blank, sullen banks of mist overhead. The British aircraft out on their ceaseless tours of patrol and reconnaissance had to come down immediately a break in the fog permitted a view of a likely landing-ground. Some had to make the best of their way back by compass, dangerously groping for home through the mist. The untold dangers offered by the fog may be judged from the fact that it was only a sudden bad taste and smell in the air that told two airmen who were returning from their patrol beat in the bitter cold of 7,000 feet up that they were

The Great War in the Air

coming down right on top of a town. It was sure testimony to the airmanship of the British pilot that there were no serious accidents. One or two machines which landed on plough instead of flat ground owing to the fog broke a strut or an undercarriage, and had to be left where they were until a salvage section with spare parts reached them from their base on motor-lorries.

The extensive series of German air raids upon French cities in the fall of 1914 had apparently two main objects; the one military, the other moral. From the point of view of the German three-month rush to Paris it was highly essential that the movements of the enemy troops should not be observed and reported upon by French airmen. The latter were intended to be kept busily engaged in the defence of their own country—and particularly Paris. At the same time a not inconsiderable moral effect was to be achieved with regard to the civil population, who would, as it were, thus have the war brought home to their own doorsteps. Had this strategic policy proved as successful as it was extensive and persistent the German General Staff would have achieved their major objective of an overwhelming and early military victory.

French Air Defences

The enemy did not hesitate long after the outbreak of hostilities to put this plan into execution. So early as August 3, 1914, a German airman dropped three bombs from a height of 4,500 feet upon Luneville, a French frontier town. A week later the experiment was repeated over Liège, where the Civil Guard drove off the intruder with their rifle fire. Both raids were but preliminaries to a long series upon north-eastern provincial cities and towns, gradually working nearer to the French capital. And towards the end of September this main aerial objective was attained. From the 30th of that month until October 2 German aircraft raided Paris incessantly. On a Sunday afternoon five bombs were dropped near St. Martin's Hospital, also a message reading: "The German Army is at your gates; you can do nothing but surrender.—LIEUT. VON HIEDSEN." The following day an attempt was made for the Opera House, while on the third day two unconnected raids

From Ypres to Givenchy

were made, in the latter of which the enemy machine was brought down. Both were fired at immediately they appeared by guards posted on the roofs of houses, but no damage was done, and the machines were able to make their way, one towards the north-east and the other towards the east. The former, after battling with a fierce bombardment from Fort de Romainville, made good its escape. The other pilot, however, was not so successful, and was brought down in flames by the guns at Fort de Champigny.

From that time the French airmen appear to have got the enemy aerial campaign well in hand. Soon realising that the best defence in the air is to assume a strong offensive, the main aircraft line now moved farther east and concentrated along the frontier, a line of aerial guards. Five German aeroplanes that had set out on bomb-dropping were destroyed within forty-eight hours (October 24-25). The first was a Taube, which flew over Rheims and dropped several bombs, that caused some considerable damage to buildings in the centre of the town. A French aeroplane immediately started in pursuit with a machine-gun on board, and an exciting chase was begun. Another German Taube, seeing its congener in a bad plight, started to the rescue, but was unable to prevent the pursuit. The German aeroplane was disabled just as it got above the line of the German trenches, and fell from an enormous height. It turned several times in the air, and its occupants were instantly killed.

Two German aeroplanes, one a Taube and the other an Aviatik, flew on the same day over Montdidier. They were similarly chased, and both of them were shot down when at a height of about 4,000 feet over Meharicourt. The fourth was shot down at a place between Dunkirk and Nieuport, and fell on the beach after it had loosed a bomb into Gravelines; and the last machine was brought down in the vicinity of Amiens.

It must be said to the enemy's credit, however, that this untoward fact in no way daunted his incessant attempts. For the second time in the war, towards the end of October, and again with a dual purpose of achieving both a military and a moral result, Nancy was visited by Taubes. Flying over the

The Great War in the Air

centre of the town from south-east to north-west, the leader dropped three bombs. However, no damage was done; and the enemy aviators proved men of humour. Besides the bombs they dropped a flag and a note. The note said that Nancy would soon become a German town, and would be destroyed by a hail of mitrailleuse bullets and by fire. Fastened to the flag was a second note, rather more explicit in its terms, which ran as follows: "We bid good day to the inhabitants of Nancy, who will soon be Germans, and we apologise for this rather eccentric method of introduction by means of powder, but we shall soon become better acquainted.—TWO AVIATION OFFICERS OF STRASSBURG."

Letters from the Air

Whether officially or unofficially, this practice of dropping notes and proclamations seems to have become extremely popular with the enemy at the end of 1914. One day a German aeroplane flew over Rheims and scattered proclamations setting forth that if the town did not surrender by five o'clock the following afternoon it would be set on fire with incendiary bombs. Another somewhat amusing instance was that of a German airship which started out from Metz, and proceeding down the valley of the Moselle, flew over Nancy. The aeronauts dropped their photographs, with a message written on each, conveying best wishes to Nancy—from the Kaiser.

Other subterfuges adopted by the enemy pilots, however, were of not so pleasant a nature. At least two instances are recorded of enemy airmen flying over the Allied lines with machines bearing French colours. In the first of these cases the machine came over the British camp near Cambrai. In the latter a German aeroplane flew over Vesour and Lure. Three bombs were dropped on the station of Vesour, but the damage was insignificant. While another crafty German device was for the pilot and observer to throw out smoke clouds, hiding themselves when fired upon by the Allied artillery.

CHAPTER VI

OUTPOSTS OF CIVILISATION

The French rout the Aerial Invader—Curious Effect of Aerial Manœuvres upon those of the Military—The Vivid History of a French Aero-plane in the War—The French Aerial Autumn Campaign outlined in Detail—Through Blizzard and Frost on the Russian Front—The Amazing Story of Prince Joachim—Russian Aircraft before Przemyśl—The German Air Services at Bay—Revelation of the German War Losses in Aircraft—Opening of the Great German Aerial Campaign against Britain.

THE reader of this history of the war in the air who has been a close student of military events of the same period, no doubt will be surprised by the disassociation of events in the air and those of the earth. Though the German armies had failed in their main objective, in the closing months of 1914, the enemy certainly had the better of the military situation. The Russian drive into Eastern Prussia had been checked, on the one hand; on the other, the enemy front line was well within both French and Belgian territory, and the German Staff within an ace of attaining the Channel ports. In the air, however, the constantly swaying pendulum of mastery inclined in favour of the Allies. Though flying was essentially part and portion of the grand scheme of campaign, the work of the battling airmen was centred in altogether another field of operations. Here victory lay with the brilliant individual rather than with the swarming mass. Aircraft were operating upon a front that was the equal of the entire length of the Allied lines, and fifty, eighty, a hundred miles in front of them. In this infinite battlefield of the air it was exceedingly difficult to keep track of the exact extent of their operations. Again, though Germany entered the war first in the air of all the belligerent nations, the combined forces of the British, French, and Russian corps easily outnumbered them. And Germany was

The Great War in the Air

further handicapped by having to divide her attentions between two fronts. The balance of the air fighting then lay with the Allies.

France, as has already been stated, had the German air-raids upon French towns well in hand. After a series of attempts upon Paris, the enemy turned his attention to the Channel ports. German aviators, meanwhile, severely bombed Commercy, Bar-le-Duc, Hazebrouck, Cassel, Amiens, and Armentières. And on the twenty-third of December three Taubes flew over Dunkirk and Calais. In both cases they were driven off by the promptitude of the French airmen. The latter had already established an excellent system of listening-posts up and down the country from the frontier to the Seine. Immediately a German aeroplane was heard coming from the enemy's country, its direction was noted, and flashed back along the line to Paris. At every aerodrome *en route* the airmen, if not already up, would be immediately ready to ascend. For the following six months only one instance is recorded of enemy pilots making an attempt upon a French town and being able to get to it unnoticed by the watchers. This occurred during a later raid upon Calais.

Raiding the Channel Ports

The rare beauty of the weather that day proved too great a temptation to be resisted. The enemy applied the latest variant of the old saying, "It is a fine day; let us go and kill something," and set out for Calais. Several bombs were unloaded in the vicinity of the town, but the Germans returned to their bases one machine short and another sadly damaged. Then, a couple of hours later, as though unaware of the fate of their previous companions, three further German aeroplanes appeared over the town, high against the blue sky. Even the vigilant French observers proved unsuspecting of this renewed visit. A fighting machine was rushed up into the sky, but already the enemy had dropped five bombs. One of these hit the railway station, and did considerable damage to telegraph and telephone wires, besides tearing up part of the track. A second bomb set the gasworks on fire, but the flames were quickly extinguished by a party of military engineers. The

Outposts of Civilisation

French sentinel machine, meanwhile, had drawn within range of the enemy, and soon a magnificent aerial fight was in progress. The Germans manœuvred their machines very well, but clearly showed that though superior in number they were not willing to engage in a combat. For some time the four machines circled round, flying as fast as they could. Eventually, however, the German aeroplanes managed to get ahead of the French aeroplane and flew off towards the German lines.

This raid upon Calais was, to all intents and purposes, the last of a long, devastating series that was intended to strike terror into the hearts of the French civilian population, and cause them to beg their Government to accept the German peace terms at all costs. Before showing how the French, on the other hand, had converted this dastardly attack into a glorious victory, a certain adventure of a French airman in this campaign must be included in this account. It was to prove one of the most dramatic incidents of the whole campaign. One sunny afternoon French sentries at Amiens suddenly spied an enemy Taube directly overhead and low over their positions. Instantly they opened with a rapid burst of fire that, apparently, proved successful in bringing the enemy airman to earth. Judge of their surprise when out of the supposed German aeroplane gracefully stepped their own great airman Garros. With a happy smile at the incredulous astonishment depicted on their faces, he related how, while chasing Taubes a few days previously he had some trouble with his motor and descended, feigning a fall. "A German pilot approached to take my papers, believing me dead," said Garros, "and when he was a few steps away I pulled out my revolver and put two bullets through him before he could say a word. Thus I secured this Taube, which is very useful for flying over the German lines. I left my own aeroplane in the care of a neighbouring farmer."

Rapid French Development

The French aerial organisation was by now assuming huge proportions. Many of the noted motor-car firms of pre-war days had had their great factories commandeered for the purpose of aircraft manufacture; while, all over the country, new factories were springing up with mushroom-like rapidity.

The Great War in the Air

Standardisation had been adopted with many types of machines, thus considerably increasing the output. And, additional to the aeroplanes supplied to both Russia and Great Britain, faster, better protected and heavier-armed machines were being turned out by the leading French makers at the rate of two and three per week; while those already in service had done much execution among the rival air fleets. Moreover, aerial co-operation with the armies on the earth was developing more and more every day. The disposition of infantry and artillery in battle was already largely influenced by the advent of the aeroplane in war. The French troops, for instance, were taught to make the most careful use of the countryside through which they were advancing—proceeding in narrow files under the shelter of trees, along the edges of villages, beneath the shadow of houses and of buildings, avoiding massed formation as much as possible, and, above all, preserving absolute silence in exposed positions. At the approach of an enemy aeroplane all movement ceased.

It was found necessary to assimilate the coverings of artillery to the surrounding ground, not only in front but also against the view from above. All movement of batteries was prohibited the moment a German reconnaissance machine hove into view. And the artillery did not re-open fire until the visitor was well out of sight, in case the flash of a gun should betray the position of the battery.

A Fine Record

At higher altitudes the airmen themselves were already evolving some sort of theory of attack and defence. In fact, so successful did they prove in these experiments that, under no circumstances now did a German aeroplane ever attack a French one; all the attacking was done by the French. Audacious as they were, however, the French airmen had learned by experience to give as wide a berth as possible to the new German anti-aircraft gun, that was most deadly between 4,000 and 6,000 feet. The earlier types of French aeroplanes were standing the severe strain of war flying far better than was anticipated. The following interesting details of the war-life of a Maurice Farman biplane will give some idea of the nature of that extreme test. This machine was built at Buc during the summer of 1914

Outposts of Civilisation

and delivered to the French army at Nancy July 16. In six months of service the following flights are recorded :

Before mobilisation, 6 hours 40 minutes.

From mobilisation to the declaration of war, 3 hours 40 minutes.

From the declaration of war until August 31, 58 hours 5 minutes.

In September, 53 hours 15 minutes.

In October, 50 hours 45 minutes.

From November 1 to 5, 14 hours.

In all 186 hours 25 minutes, during which a distance of about 11,000 miles was covered.

During its period of active service the biplane received 180 shot-holes in the wings, and there were marks of 60 shell-bursts, without including 25 broken wires, two broken propellers and seven holes in the hood.

One explosive shell, fired by a three-seater Aviatik, pierced the right side, passed within a few inches of the petrol tank, and went out again by the left after rebounding off the steel plate protection. The shell then burst on a bolt, and a rain of fragments tore the two wings of the lower central plane.

Two rifle bullets shot almost vertically pierced the right side of the hood and became embedded in it. Another fired from a trench over which the biplane was passing at a height of 300 yards glanced off a bolt and passed within a few inches of the pilot's head in front of the seat of the observer. A shrapnel ball grazed the back of the pilot and pierced the writing tablet of the observer.

The M.F.123 was right over a captive German balloon, upon which it was about to drop a bomb, when it was finally hit in forty-seven places by shrapnel bullets, one of which passed through the little opening in the armour of the machine through which the observer looks when he drops a bomb. The pilot was then forced to descend in his own lines, where it was found that the propeller had a hole in it as big as a man's fist.

Of the work of these French machines, in the hands of their capable pilots and observers, no more comprehensive statement could be made than that the French Command succeeded in covering in a single phrase. "They"—the aircraft—"clear the

The Great War in the Air

skies of Taubes," they reported. The entire campaign is summed up in those six short words. Comment had already been made in civilian circles in France regarding the lack of details about the work of the Air Force. To quieten these doubts a long communiqué was issued, containing the above remark. And, to emphasise it, certain other details were added. A few examples will suffice :

"September 3.—In the course of a reconnaissance a French pilot was attacked by a German aviator. The latter was promptly pursued by a second French aviator, who, subjecting him to a violent rifle fusillade, forced him precipitately to descend.

"September 5.—A French aviator struck a bivouac of a company of the Guards, with the result that eight men and eight horses fell, while thirty-two soldiers were wounded.

"September 12.—A German non-commissioned officer showed his men a coat almost torn to tatters, which belonged to one of some sixty men wounded by a projectile that had just been hurled by one of our aviators.

"End of September.—At Autry a bomb killed some thirty soldiers at the edge of the Serlut, another projectile killing or wounding twenty soldiers. A staff major installed there had to change his quarters in all haste.

"October 9.—A bomb which burst in the midst of a group of cavalymen killed thirty men and fifty horses.

"October 15.—To the south-east of Lille a cavalry division which had been pursued and fired on during the whole of the day was at length prevented from carrying out its object by a bomb.

"November 1.—A staff major at Thielt had a severe trial from the fire of our aeroplanes, which hurled thirty-two bombs or shells there." This information, which was gleaned from "notebooks found on the German dead and wounded and prisoners goes to prove that our aviation branch has performed its duty well, and produced at times the most startling effects."

According to yet another French communiqué, up to January 31, 1915, the French airmen had undertaken 10,000 reconnaissances, which involved 18,000 hours of flight.

Outposts of Civilisation

The story of the Russian winter campaign is one long struggle against adversity. The German boast of Hindenburg's "colossal" victories being due to his knowledge of the low lying, swampy marshes of the Russo-German frontier, coupled with an unusual grasp of local conditions, is no idle exaggeration. Possibly no country in the world is less suited by nature to military operations. Flat, swampy, with a mere handful of useful roads, and no railways worth speaking of, the Russian theatre of war was a true test of genius to every military commander concerned. Even in summer, two days out of seven the surface of the earth was shrouded in an impenetrable mist of grey. With the autumn these weather conditions became almost insurmountable. The wet ground was constantly frozen during the night and thawed by the sunshine during the day, and often reduced to a morass. The Germans found that the condition of the roads and fields made any movement of troops or guns impossible. Accustomed to manoeuvre under pleasanter and easier conditions, short of necessary cavalry patrols, the horses of which were being saved up for the spring campaign, the enemy commanders found it necessary to fall back on the reports of their aeroplane observers for all their information. And here again they were handicapped. The saturated condition of the ground rendered the use of aerodromes almost impossible. Two German aeroplanes had already been bogged and had had their wings broken through descending in such places. By cleverly placing their landing-grounds well behind their firing lines on higher and firmer soil, the Russians, however, had overcome this difficulty; and the consistently accurate reports of their airmen played no small part in the long series of victories that they were achieving at this period. Both sides longed for the winter and more settled weather conditions.

Through Blizzard and Frost on the Russian Front

When at length the hard frosts set in the flying took place under the most romantic conditions imaginable. Through the long Russian nights, beneath a sky studded with stars and reflected vividly against the infinite stretch of dazzling white snow that swept like a sea to the horizon on all hands, the

The Great War in the Air

airmen of both armies were constantly on the wing. With the thermometer standing several degrees below zero, and suffering untold agonies from the intense cold, the air war waxed brisk and deadly. Reconnoitring, raiding, directing the fire of the heavy artillery—the flashes of which showed up dancing lines of flames, visible for miles against that startlingly white background—they more often than not paid for their temerity with their lives. Harrowing and tragic indeed were the stories of those frost-bound days and desperate nights of arctic cold. Frequently the aviator would return to his aerodrome frost-bitten in arm or leg; and sometimes these limbs had to be amputated. In one case, that of a German reconnaissance machine, after travelling over a hundred miles into Russian territory it was brought down by shell-fire from the ground, and it was found that both pilot and observer had been frozen to death with the cold. At the height of Hindenburg's October advance a German airship, coming from the side of Prushkow, showed itself through a snow cloud. There was a flash very high up, and a report which must have come from a prematurely exploding bomb, and the airship had disappeared again into the snow cloud.

Zeppelins at Warsaw

On this Eastern front the enemy employed his giant Zeppelins for raiding purposes in preference to aeroplanes, but the scheme of operations differed very little from that carried out against the French. Warsaw, in place of Paris, was the main objective of the German airmen, and for three months the unfortunate city was raided continuously. Not that the enemy did not pay the price for this "glorious" victory. He lost several Zeppelins, either from shell-fire or from storm. The most disastrous of these losses occurred at Libau with the L15. Coming in from the direction of the sea, this aerial cruiser arrived over the town about half-past nine in the morning. It was flying at a height of only 500 feet, and after circling the Libau-Rowno railway, sailed away to the west.

At the moment when it descended nearest to the earth the airship discharged a cloud of smoke, which momentarily hid it from view. When the smoke cleared away it was possible

Outposts of Civilisation

to distinguish the flag and number of the ship, as well as the faces of the crew, who were, at this moment, busily engaged in dropping bombs over the side of the gondola. The reports of these bombs brought crowds out into the streets, but, apart from a few panic-stricken women and children, the population preserved an admirable composure. Half an hour later a large motor-car dashed down the main street. Its passengers cheered, and shouted that the airship had been shot down by the frontier guard twelve miles south of the town, and had fallen into the sea about a mile from the shore, and that the crew were being brought to Libau in a boat.

Subsequently it appeared that as soon as the airship came in sight the commander of the frontier guard gave orders that it was to be pursued with motor-cars. Getting within range, the guards opened fire and soon brought the raider down. When it collapsed into the sea the crew waved a white flag, and were taken off by Russian Government tugs. The crew consisted of a naval officer, an army officer, and five men. The airship itself was of the Parseval type and was completely destroyed.

The loss of this ship appears to have struck terror into the hearts of the German aeronauts. Almost immediately aeroplanes were substituted for the Zeppelins. The former, mostly new craft, with young and eager pilots fresh from the training grounds, carried on the campaign without a halt. From the beginning of December, 1914, until the end of January, 1915, Warsaw was bombed incessantly. German aeroplanes, on December 3, killed eight persons and left the Marzalkowska a mass of ruins. For the third consecutive day, January 28, 1915, the town was visited by enemy airmen. About three o'clock in the afternoon was the usual time for these visits. The raiders always flew over at a great altitude, immune from anti-aircraft fire. They never waited for long, but, once having dropped their bombs, fled hurriedly towards their own lines. Said the inhabitants somewhat ironically as they watched the lithe forms fading away to the west: "There they go; all in a hurry to get their Iron Crosses again." The regulations for lighting throughout the town were rigorously enforced by the authorities. By 11 P.M. the entire town was in absolute darkness, the only visible sign of life being the twinkle of the

The Great War in the Air

sparks from the trolleys of the tramcars. Warsaw, however, took these demonstrations of aeroplanes easily, and their flight over the city scarcely awakened more than a passing interest, hardly anyone taking shelter, even when an aeroplane was directly overhead. However, there was much curiosity and speculation as to the significance of this continuous aerial work.

Here again it is possible to trace in the cunning working of the German mind the laudable military intention of keeping the Russian aircraft well engaged in their own country. Hindenburg was staking everything on the coming spring campaign. And all these events of the air seem naturally to lead up to the grand climax of that bitter-fought spring campaign with the disastrous Austrian defeat at Przemyśl. For over a fortnight there was little or no activity on the part of the enemy aircraft. The Zeppelins, as will be disclosed by later events in a different theatre of operations, had been transferred *en masse* to the new giant sheds in Belgium. Bombing machines no longer appeared over the city. Those that did fly over the Russian frontier were all too obviously engaged in watching the railway stations both here and at Praga, counting the passing troop trains. Some of these reconnaissance machines now commenced to fly farther into the interior, along the Vistula in the direction of Novogeorgievsk. Some days later one of them was brought down as far across the frontier as Bjela, which is 200 versts west of Warsaw. Two very young men, a lieutenant and a soldier mechanic were on board. When the military guard came to remove them from the estate on which they had been captured, they found the lieutenant at a piano playing Mendelssohn—much as did the French prisoner of 1812 in Turgenieff's story.

Lodz and Lowitsch were the next towns to be visited; and at Skiernewice the Germans gave further evidence of their policy of kultur by annihilating the entire population, some 200 souls, with bombs from the air. At Lodz the extent and nature of the destruction was indescribable. In the Piotrkow Street fourteen persons gathered in a group were killed by a single bomb. But it must be admitted that the townspeople and villagers showed incredible incapacity to judge what was dangerous and what was not, and to take the necessary pre-

Outposts of Civilisation

cautions. Whenever a raiding aircraft appeared overhead the Poles collected in crowds. When the enemy rushed Prushkow in October, trippers went to "see" them. A shell which killed half a dozen ended the trip.

The Russian foot soldier, though he held the German aeroplanes in great respect, was fully convinced of the superiority of his own aircraft. On one occasion, when a division of infantry was quartered in a large town near the frontier, a furious battle raged among the clouds overhead. But the infantrymen did not seek shelter. With the truly typical shrug of the shoulders, they remarked: "Well, there's no danger, our men are up there as well." Thousands of them thronged the streets watching the white puffs from the Russian shrapnel bellying out round the soaring enemy aviators. While one of these aerial visitors was about, the roofs, bridges and open spaces were manned with riflemen, whose shooting rang out in an unbroken rattle. And, indeed, one of the enemy's aeroplanes was forced by the infantry fire to descend beyond Novogeorgievsk. Another raider was hit by the artillery fire and eventually forced to come down between the Russian and Austrian trenches. Thus when, on October 17, an Austrian aeroplane from Cracow flew over the Russian positions and dropped printed appeals to Russians from 243,000 comrades, promising good fare, tobacco and rum, the propaganda mission did not meet with quite the success that had been anticipated. And even the Austrians themselves were surprised when, the following day, as a return visit, a daring air raid was effected by a Russian officer over Stallupoenen. The railway station was reduced to ruins, and a considerable part of the line was destroyed by the bombs.

Prince Joachim Flies to Safety

The intense frost that now set in, coupled with the ominous moral of the crew of the German aeroplane who had been frozen to death in mid-air, suspended all serious aerial work from now until the end of February of the following year. But, in the interval, a most romantic episode is reported by a correspondent of the *Daily Telegraph* at Petrograd. Said this correspondent: "A curious story of the Emperor William's youngest son, Prince Joachim, being wafted away from capture

The Great War in the Air

in an aeroplane is told in the *Courier* by a wounded Russian lieutenant, who has arrived here from the front. This officer relates that at the battle at —, on November 24, the Prince was in command of the Germans.

"It appeared that when the Prince heard of the unfavourable issue of the battle he jumped on to his horse and, wrapping a coat round his head to conceal his identity, galloped off after the retiring troops. At this juncture three aeroplanes were circling round above —, and, as afterwards became clear, their purpose was to discover the whereabouts of the Prince and rescue him from danger.

"Two aviators who attempted to descend near him came into the fire of the Russian artillery and their machines were disabled. By this time the Prince was with a considerable number of German troops who were completely surrounded by the Russians, and his position appeared to be very critical. Just in the nick of time, however, the third aeroplane came down near him, and taking the seat of one of the aviators the Prince was borne away into safety."

These intervening months of idleness in the air were not wasted by the Russian authorities. The aircraft output of the country was almost doubled. Training centres for airmen were established in all parts of the country, and the personnel increased by nearly fifty per cent. General Baron von Kaulbars, of the Russian General Staff, was dispatched to Sir John French's headquarters on the Western Front to "study the British aviation system," a mission in which he was accorded every facility by the British Commander. Thus the Russians re-opened the spring aerial campaign considerably stronger both in aircraft and personnel than at the termination of the autumn operations. At Lowice military observers had already reported the German evacuation movement that was to terminate the big rush on Warsaw. All through February, when the Austrians were straining every nerve to advance their positions at Przemyśl, their air scouts were constantly driven back and forced to earth behind that city, and though they, in their turn, maintained a particularly heavy fire on the Russian reconnaissance machines, they were unable to prevent them from gathering the vital information that they sought. Then

Outposts of Civilisation

the Austrians added further to their defeat by losing a new machine of the Albatross type, that was shot down near the station of Sokolka, the aviators being taken prisoners.

The Germans in Retreat

Towards the middle of March the aerial war was again in full swing. At several points the Russians, after hard fighting, defeated the Germans, who retreated, being incessantly harried in a most costly retreat by the daring Russian airmen. On March 12 the following semi-official statement was issued at Petrograd:

"The comparatively calm and clear weather of the last few days has been made use of by us, and by the enemy, for aerial reconnaissances. Many aeroplanes and dirigibles have flown over various positions.

"Our large dirigible, 'Ilia Mourmetz,' took part. The enemy's aviators threw some twenty small bombs on Ossovietz, but did no damage to the fortifications, which have to support thousands of heavy bombs from howitzers.

"On the right bank of the Vistula, near the village of Verzbove, we captured a brand new German aeroplane, in first-class condition, with two aviators. In the Pilitza region Captain Kravtsevitch attacked and put to flight a German aeroplane, which, however, succeeded in coming down in its own lines.

"At certain places the enemy dropped incendiary bombs from its aeroplanes, but was unable to set fire to anything. Both our heavy artillery and that of the enemy have shown a very great activity."

The Germans, however, were having a far from pleasant time with their "heavies." Reliable reports said that Field-Marshal Hindenburg's advance plans had been badly hampered by the impossibility of moving up his heavy artillery, supposed to include a 42cm. mortar. At frontier stations, and outside the stations, there were guns that had come to an absolute standstill in the deep mud. Such as were successful in moving forward did great execution in the Russian lines. In this they were aided to a great extent by the excellence of their aircraft direction. There were fired a great variety of shells, ranging from those of an obsolete pattern to those of the very latest type,

The Great War in the Air

relying for their effectiveness largely on the diffusion of suffocating gases. Thus, incident by incident, day by day, the great battle was working up to the ultimate capture by the Russians of the great city of Przemyśl.

On the Dunajetz the Russian anti-aircraft guns winged an enemy aeroplane, but did not succeed in capturing it, as it fell among the enemy's lines. Over at Ossowice, now deeming the use of aeroplanes to be without service, the Germans made several attempts to send up a captive balloon, but it was immediately brought down by the Russian artillery. In the Bobr marshes, near Eastrezembe, yet another German aeroplane was captured with an officer. Considerable surprise was evinced at Russian headquarters, both in this protracted use of enemy aeroplanes and at the dangerously low altitude at which they always flew over from the direction of Przemyśl, until one day word was received from a spy inside the city walls that an entirely novel and interesting use was being made of Austrian and German aircraft. Communication between the fortress and the Austrian lines was maintained daily by the use of aircraft, which kept up a regular post, taking out letters and bringing back as much stores as their machines could carry. One of these machines was able to carry as much as 4 cwt., and used regularly to bring out two sacks of letters and cards. Balloons were also employed. In fact, within twenty-four hours an aeroplane and three balloons, conveying staff officers of high rank who were attempting to get away with documents of extreme military value, which they did not wish to fall into the hands of the Allies, were forced to come down at Sokal, Brest Litovsk, and Kamenez Kitovsk in consequence of a sudden change of wind, which carried them northwards. They were each and all taken prisoners by the Russian inhabitants.

The German Air Service at Bay

Along the battle lines themselves the bright, clear, sunny days now prevailing were freely utilised by both sides for aeroplane enterprise. The Russians, however, were again favoured with better natural positions for aerodromes. Their reconnaissance officers were constantly bringing in reports

Outposts of Civilisation

that in the low-lying ground between Mishinetz and Kolne, which had been for the present transferred into one huge unbroken lake, in certain points the German aerodromes were deep under the mire, and several aeroplanes were embedded therein. And on March 31 another semi-official statement was issued from Petrograd to the following effect: "Near Jebwabno we brought down an enemy aeroplane, which fell between the opposing lines of trenches. The aviators, both the officer and his mechanic, were taken prisoners. During the last few days the German aeroplanes have shown great activity. Near Ostrolenka, on March 29, fifteen enemy aeroplanes dropped as many as 100 bombs on an isolated house, which they probably thought was the Russian headquarters. Not a single bomb struck the house, of which the inhabitants were all safe."

Some considerable comment has already been made, both as regards the development of other belligerent air forces, also concerning Germany's policy in the air regarding both France and Russia. Germany was the common foe. Against Germany, and against her alone, had been set up these long, determined lines of battling aircraft—outposts of civilisation. The whole of civilisation, in fact, was by now, with the possible exception of America, ranged against her. But she was wafted on by a terrible determination, and she still fully believed in the policy of Might that must eventually overcome that of Right. To this end she redoubled her activities in every branch of her fighting forces, and particularly with her aircraft. A reliable authority at Berne reported on January 19, 1915: "I hear from a trustworthy source that Germany is intensely busy building aeroplanes, and that in all the aerodromes beyond the Rhine thousands of young Germans are training as pilots and mechanics. Germany's ambition undoubtedly is that her aerial fleet should greatly excel that of the Allies." With her new types of machines Germany was undoubtedly making great headway. One new plane, flown by the celebrated pilot Beatsche, measured 55 feet in breadth and was 35 feet long. It was a two-seater, with ample accommodation for guns and ammunition. Another new machine, invented by an engineer of Prague, named Stianzy, a former pupil of the Russian aviator Sikorski, was provided

The Great War in the Air

with two benzine tanks of 800 litres capacity each, an oil tank with a capacity of 40 litres, and receptacles for a great number of bombs. It was driven by two engines of 100 h.p. each. But, unfortunately for the enemy, during its trial flights the forepart of the machine, while running on the ground, suddenly broke off, the machine capsizing and being completely destroyed. The building cost is said to have been no less than £5,400. By the end of November, 1914, according to the statement of a German prisoner, formerly a mechanic with their air force, there were only one or two Taubes left, and the principal machine now in use was the Aviatik biplane, which had an armoured prow fitted with a machine gun. The manufacture of the Taube type had been stopped, as the machine had proved very far from satisfactory. Though extreme care was taken on the part of the German authorities to suppress this fact, as has been seen, it eventually reached the ever-watchful ears of British headquarters, and with it came other and even more valuable information, namely, the exact total of the enemy losses in aircraft. Since the outbreak of hostilities the Germans had already lost seven Zeppelins, 52 aeroplanes, 86 officers and men. At this period the enemy possessed, at the outside, 26 airships and 287 aeroplanes. They were also short of competent pilots, although the Johannisthal school of flying was working at full pressure training new men.

Faced with this huge deficit, and urged on by the great public indignation at the failure of the High Seas Fleet to raid England, the German High Command determined to devote all their surplus energies to the air force. In this determination they were constantly spurred on by the criticisms of the German Press. The *Hamburg Nachrichten*, for instance, one day announced, in an article headed "We Have Only One Enemy," that: "A striking proof of this phrase is the new prizes which, according to the official *Reichsanzeiger*, have been set apart for special military achievements. Three of the four prizes are aimed against England, and consist of sums of money from £25 to £125. These amounts will be awarded to the first soldier who steps upon the soil of Great Britain as a combatant, to the crew of the airship which before

Outposts of Civilisation

December 31, 1915, accomplishes a first flight to the English coast and drops explosives on English territory, and to the aviator who drops the first bomb on Dover." This mention of Dover is of the utmost significance at this time.

Plans to Bomb England

The great plan of the aerial campaign on England was already being mooted in official and semi-official circles—wherein a Government-controlled Press might very well be included—in Berlin. At the same time the raids were to furnish the quietus to unpleasant questions concerning the continued inactivity of the German Navy and to build up the moral of the civilian population in general. On January 15 the following highly significant statement appeared in the *Frankfurter Zeitung*, concerning a certain aerial enterprise that gave the entire Press considerable food for comment. "After England has had to experience, through our cruisers and submarines, that though an island she is not by any means safe from attack, she has now to acquire the dangerous knowledge of how German bombs operate. Our aircraft have paid sea-commanding Britannia a visit, and afforded a new and brilliant proof of the bravery of our aeronauts. What we have heard of the appearance of German aircraft over Calais has been in effect that a squadron flew in the direction of Dover." Another paper in Berlin, referring to the same raid, said: "The flight over the Channel was not the accidental success of some especially clever airman, but a systematic attack carried out by a squadron of some sixteen aeroplanes. If the object of the raid—the cruise was no doubt intended to extend to the English capital—was not achieved, that was due not to uncommonly comprehensive defensive measures on the English coast, but purely to the thick fog, which hindered the operation. At any rate, Dover has been bombarded, and the terror which the expedition has unquestionably caused is easy to understand." The *Berliner Tageblatt*, on the same subject, is essentially more cautious. Its version of the affair was that the squadron reached the Channel with the intention of proceeding to England, but that, owing to delay caused by bad weather, it had to return in the direction of Dunkirk. While

The Great War in the Air

the true facts of the raid were that a squadron, consisting of fifteen aeroplanes and a Zeppelin, set out late one afternoon to raid London. Flying down the Belgian coast, and well out to sea, at the mouth of the Thames they ran into a dense bank of fog. The weather gradually grew worse, and a violent wind springing up at this time, they turned round for their own bases, without so much as dropping a solitary bomb on British soil. Afterwards the squadron proceeded in the direction of Dunkirk.

As a main base to this campaign the Germans had established a huge aerodrome and supply depot at Ghistelles, southwest of Ostend, which all through the war was to continue the seat of their aerial operations on the Western Front. Smaller stations were situated in the vicinity of Ghent, Namur and Liège. To these aerodromes were dispatched all the new squadrons of Aviatiks, together with every type of new plane of the moment.

CHAPTER VII

ZEPPELIN WARFARE

Résumé of the History of the Airship—Comparison of Aeroplane and Airship for War Purposes—British Anti-Zeppelin Devices—Schutte-Lanz and Parseval—German Strength in Zeppelins at the Outbreak of Hostilities—Types of Zeppelins—Super-Zeppelins—The German Aerial Invasion—The R.F.C. and Zeppelins—Zeppelins in Naval Warfare.

THOUGH aeroplane fighting was in its veriest infancy, Zeppelin warfare, even prior to the outbreak of hostilities, had been developed to such a dangerous state of efficiency as to become the prime factor in the German aerial campaign. What the U boat was to become in her later war by sea, the torpedo boat to the British Navy, the heavy artillery shell to the B.E.F., the "75" to the French, and the machine-gun to the German Army, was Count Zeppelin's mammoth airship, at this time, to the battle by sky. With the enemy it was the Zeppelin first, the aeroplane a long second. It was with the Zepp. that "sea-ruling Britannia" was to be humbled in the dust of aerial destruction. It was both sponsor and foster-child to the new-born hatred of England; the kultur of strafe. The question of the Zeppelin then was the first of the day. And this again, in its turn, involves the wider controversy of war by airplane or war by airship.

For purposes of precedent it is well immediately to state that the airship is by far the elder of the two craft. And a short survey of past history is here essential. As long since as 1852 a dirigible made a first successful flight over France. This ship was constructed by Henri Giffard, and made several flights at an average speed of six miles per hour. Previous to this date, however, experiments had been made by the brothers Robert, in 1784, in an oblong-shaped craft, 52 feet long and 32 feet in diameter, buoyed up by pure hydrogen.

The Great War in the Air

A flight of over a kilometre was accomplished in this craft. The Duc de Chartres made a flight in another of the Roberts ships. On this occasion the dirigible encountered a strong cross-current that tore the airbag from the envelope, covering the neck and preventing the necessary escape of the hydrogen gas. Only in time did the duke avert catastrophe by plunging his sword into the envelope, and in this drastic manner releasing the pressure on the highly distended envelope.

The next recorded flight was that made by Dupuy de Lome. Ten years later Tissandier attained an average speed of ten miles an hour. In 1872 Hanlein, a German, constructed an airship propelled by a 6-h.p. Lenoir gas-engine that touched a speed of ten miles. Again in 1879 Baumgarten and Wolfert constructed an airship, which unfortunately was burnt in its first attempt at flight. And it was not until 1884 that the dirigible developed true airworthiness. In that year Captain Renard flew around Paris at a speed of $14\frac{1}{2}$ miles an hour.

Some Early Dirigibles

Schwartz, an Austrian engineer, in 1897 built the first rigid airship fitted with a petrol motor. And following this came the period of Santos Dumont, the best known of all aeronautical pioneers, and of Count Zeppelin. All these earlier types of dirigibles were, in reality, balloons fitted with mechanical propulsion. Several of the earlier types were driven by hand propulsion, by means of oars. The Zeppelin, or the super-Zeppelin of later years in the war, and the old-fashioned spherical balloon of the past consisted alike of two main portions, the gasbag or envelope and the car. The envelope of the old balloon was always spherical in shape, and was inflated with hydrogen or with coal gas. Hydrogen gas is the lightest gas known, being only 7 per cent. as heavy as air, of which 1,000 cubic feet weighs 50 lbs. Thus 1,000 cubic feet of hydrogen will give a lift of 74 lbs., or practically 35,000 cubic feet will lift one ton. It must not be forgotten, however, that that "lift" must include the weight of the balloon, car and gear, and if a 35,000 cubic feet hydrogen balloon weighs half a ton, it will lift only another half a ton besides its own weight. A modern Zeppelin was accredited with a

Zeppelin Warfare

lift varying from 20 to 28 tons. Coal gas is somewhat heavier than pure hydrogen, and was not used for filling airships or balloons for war purposes.

Once in the air, there are many factors that must be taken into consideration. Chief among them are the natures and properties of the gas, and, for that matter, of all gases. The effect of heat upon gas is to make it expand, which expansion causes the balloon or airship to rise. Per contra, cold causes the gas to contract, and incidentally causes the craft to descend. It will be seen, therefore, that on a fine sunny day the craft will rise with greater ease than when the elements are dull and cold. Air pressure is another factor which must be considered, and this is greatest at sea level. The greater the altitude the less the pressure becomes, and the less pressure on the outside surface of the envelope the easier it is for the gas to expand; but this is compensated for by the fact that the atmosphere is considerably cooler at a high altitude. Practically these are the only factors governing the science of aerostatics, and we may state briefly that to make a balloon or airship rise it is necessary to lighten it. This is accomplished by throwing ballast overboard in the form of sand. To make it descend, gas must be dispensed with by allowing it to escape, thus reducing the lifting forces.

Rigid and Non-Rigid Types

Airships, of which Zeppelins are the largest and were the most perfect type, are nothing more than huge balloons driven in a forward direction by mechanical propulsion. The shape differs materially from that of the old balloon, being rather like that of a long cigar, but this is because such a shape offers less head resistance. Altogether there are three types of airships: the "non-rigid," in which the two portions, the car and the envelope, are entirely separate, being held together by means of rigging—the majority of the earlier British airships were of this class; "semi-rigid," in which the car is partly attached to the envelope, a type greatly favoured by the French and the Italians; and the "rigid" airship, of which both car and envelope are in the same framework. The Zeppelin is of the latter class.

The Great War in the Air

From the entry of the Zeppelin into war it was at once a matter of doubt and also of exaggeration as to their suitability for battle conditions. Where some experts openly scoffed, some went to the other extreme and prophesied in the Zeppelin the end of all war. The destruction they will wreak, said these wise men, will render all future war too ghastly for contemplation. Between these two extreme view points, then, it is necessary to draw a more moderate deduction. A comparison of the two craft as vessels of war will suffice. It is discovered that "lift" is the property that most stringently divides the merits and the demerits of the two. The weight of the aeroplane body, wings, engine, fittings, etc., takes up at least 50 per cent. of the total lift. The weight of the pilot, observer and accessories takes up another 25 per cent., which allows only 25 for "war lift," or that necessary for bombs, ammunition, machine-gun, and spare petrol. Therefore, in the all-important matter of "lift" the Zeppelin gains considerably.

The aeroplane, however, has a distinct advantage over the Zeppelin in the matter of speed in a lateral direction. But the latter is becoming faster every day. The aeroplane, again, is essentially a craft of the daylight, though in the closing months of the war the splendid night-bombing machines of the Independent Force, R.A.F., were to rebut even this theory. The supply of petrol aboard is limited, and the duration power is considerably less than that of the airship. In the darkness the aeroplane pilot rarely sights a Zeppelin, the meeting being entirely a matter of luck and circumstance. The Zeppelin pilot can shut off his engines, and by ballasting can proceed unimpeded almost at his original altitude—a feat the aeroplane can never accomplish—and be able to listen for the approach of the aeroplane by the sound of the engine, and manœuvre accordingly.

The aeroplane can only bring a Zeppelin down once it has climbed above or on a level with it; and it must be admitted that in that position the airship is entirely at its mercy. Several of the Zeppelins had a machine-gun mounted on top of the envelope, but this weapon was little better than useless against bombs. Again, however, for the aeroplane pilot the

Zeppelin Warfare

danger arises. In bombing he may miss the enemy craft and the bomb drop down to the earth beneath. Should engine failure occur while in mid-air the aeroplane must come down immediately, but the Zepp. can continue on its way.

Although the altitude record of the aeroplane is considerably higher than that of the Zeppelin, the average flying level is considerably less, being with the former some 16,000 feet, with the latter some 18,000.

The aeroplane, as a craft, is comparatively inexpensive to construct, the landing ground required not extremely extensive, nor is the personnel to maintain the craft on the ground. The aeroplane hangar is no mammoth erection. The Zeppelin, on the other hand, is extremely expensive to construct. The personnel aboard require at least twelve months' preliminary training. The landing ground required is enormous, likewise the personnel to house the craft, also the shed to contain it.

The Zeppelin is much more the victim of adverse weather conditions, and thus less airworthy. There have been considerably more craft lost that way than by war casualties.

It must be an extremely fast aeroplane with great climbing powers to successfully tackle a Zeppelin in mid-air; and, again, the aeroplane must be well up in the air before the Zepp. arrives overhead. The German Zeppelins, it is known, have on several occasions been convoyed by powerful-engined aeroplanes, and this fact immediately leads one to observe the similarity between this manœuvre and that of the large type of warship convoyed by a skirt of torpedo boats at sea.

Entering upon the actual combat, the Zeppelin is more heavily armed, and the steadiness of its gun platform allows it a greater advantage in the matter of accuracy of firing. It is, however, when compared with the aeroplane, a slow and clumsy craft to manipulate. It is preferable for two or three aeroplanes to attack a Zepp. at one and the same time. Some of the earlier British anti-Zeppelin devices were described in an American paper as follows:

"In spite of the tendency to exaggeration in the reports of the new war material which is being developed in Europe, it is possible to sift out the true from the false, and there is

The Great War in the Air

good reason to believe that the British, in their latest aeroplanes, have found an effective answer to the Zeppelin.

"When the first raids on London were made the British possessed neither the guns nor the aircraft in sufficient numbers or quality to meet, destroy, or drive back the latest Zeppelins. The anti-aircraft guns could not reach effectively the great heights to which the Zeppelin could rise, nor could the aircraft rise in time to attack. Since that time both guns and aircraft have become thoroughly efficient for the work. Just in what numbers and what calibre are the anti-aircraft batteries with which London is now so well defended is not known; but, because of the great value of high velocity and a straight trajectory for anti-aircraft fire, it is a pretty safe guess that there are many batteries of guns larger than the 3-inch. The 50-calibre 4.7 and 6-inch gun, if fired at high angles of elevation, have a trajectory of slight curvature, and the time of flight is small, elements which simplify the task of the gunner in finding and keeping on a moving target.

"Information is now available as to the new anti-Zepp. aeroplanes, and Lieutenant —, of the Royal Flying Corps, who recently landed in New York on furlough, has given some details which agree with information we have received from another source. The problem has been to build an aeroplane with climbing powers sufficient to enable it to reach Zeppelin altitudes in time to meet the raiders and bring them down. The latest machines are of comparatively small wing surface, and are driven by unusually powerful engines, capable of making speeds of 120 to 140 miles an hour. The increase in climbing speed in the past few months has been truly astonishing, having progressed from an ascent of 10,000 feet in six minutes to 15,000 feet in seven and a half minutes. The scouting service, both on the North Sea and along the East Coast, is now so effective that London is warned of the approach of the Zeppelins in time to permit the Zeppelin chasers to take the air and be in position for an attack before the raiders reach their objective."

Meanwhile, however, it must not be overlooked that Germany did not confine all her attentions in the matter of airships to the Zeppelin. Among her other accomplishments

Zeppelin Warfare

was the Parseval, a type of "semi-rigid" airship, the principal feature of which was the arrangement by which the suspension cables allowed the hull to be canted in relation to the angle of the car, in order to enable her to climb at a much increased speed. The first Parseval was produced in 1906, but was not a very great success. The second was 190 feet long, 35½ feet in diameter, 113,000 cubic feet capacity, possessed of two 120-h.p. engines, and fitted with the same system of suspension as number one. She made many voyages, with sometimes as many as twelve passengers aboard.

Another type was the wooden Schutte-Lanz, an attempt by a firm at Mannheim in 1912 to produce a rigid airship constructed of wood braced with wire. It was cigar-like in shape, and approximately the same size as a Zeppelin. However, the wooden structure rendered her considerably heavier than the latter craft. And no very successful flights were then made, though it is known that several of the Schutte-Lanz craft have participated with the Zeppelins in raids on this country.

The Zeppelin itself is due to one man, and one man alone. The grey-haired, bent old Count, formerly an officer in the German Army, who lived to find himself, a once much despised, impoverished inventor, acclaimed the saviour of his country, loaded with honours and riches, the personal friend of the most aristocratic of aristocracies, and a notorious figure in the history of the world. His iron will and determination triumphed over poverty, adverse circumstance and disbelief alike, until finally he forced the very people who had formerly regarded his invention as a waste of time and of money to clamour in a wailing hell-chorus for that same craft.

Zeppelin commenced his experiments at Friedrichshaven, on the shores of Lake Constance, in 1900. The first ship was 400,000 cubic feet in capacity, possessed two 16-h.p. motors, weighed 9 tons, and carried five men. It made only one flight, but during the course of that remained in the air for one and a quarter hours, and reached an altitude of 1,000 feet.

Encouraged by this success, the old man constructed, with the aid of his influential friends, a second craft in 1906. This ship was more powerful than her predecessor, and possessed

The Great War in the Air

two 85-h.p. Daimler engines. A trial flight was made in November of that year, but the craft was wrecked shortly afterwards in a violent gale of wind.

Undeterred by these added misfortunes, he persevered, constructing fresh ships as year succeeded year, until eventually he received royal patronage and the aid of the State, and at the outbreak of hostilities was able to place at the disposal of the authorities some fourteen ships.

Immediately prior to the war the Germans were in possession of thirteen Zeppelins, one of which was almost destroyed—the Z II., brought down at Thionville. One other, the Z IX., was nearing completion. These ships were in order of construction: Z II. (17,800 c.m.), Viktoria-Luise (18,700 c.m.), Z III. (17,500 c.m.), Hansa (18,700 c.m.), Z IV., which came down at Luneville (19,500 c.m.), Sachsen (19,500 c.m.), Z I. (Ersatz II., 19,500 c.m.), Z V. (19,500 c.m.), Z VI. (19,500 c.m.), Z VII. (22,000 c.m.), Z VIII. (22,000 c.m.), L 3 (27,000 c.m.), and Z IX. (22,000 c.m.). The Hansa and Viktoria-Luise were both passenger-carrying airships belonging to the Delag Company, and the Sachsen, their sister ship, had gone over to the Navy in May, 1914. L 3 belonged to the Navy, the others to the Army.

A French Expert on Zeppelins

"The real offensive value of the German aerial fleet, however, is the efficiency and numbers that 'compose it,'" wrote M. Georges Prade, the noted French aerial expert, shortly after the outbreak of war. "Let us, therefore, establish these two points and commence by defining what a modern Zeppelin is. The imagination has been given free play on this subject, and, as if the Zeppelin were not already monstrous enough, rumour has made them even larger. Some writers have even gone so far as to talk of 'super-Zeppelins' of 400 yards in length, which presumes a trifle of 300,000 cubic metres. It can be stated without hesitation that the modern German dirigibles are of the same tonnage as before the war, which is, of course, necessary for their rapid manufacture. Material proofs of this statement, of which the first, sufficient in itself is the actual dimensions of the German sheds, are obtainable.

Zeppelin Warfare

The longest shed in Germany, that at Leipzig, is 193 metres, and those at the works of Friedrichshaven, which have not yet been enlarged, is 180 metres. Those at Cologne, Metz and Baden are only 158 and 160 metres. The French hangar at Maubeuge has lately been enlarged to 160 metres by the Germans. The two 1914 types of Zeppelins measure: The 22,000 c.m. army airship, length 156 m., diameter 14.8 m. The 27,000 c.m. naval airship, length 158 m., diameter 14.8 m. These figures represent, therefore, the maximum size airship which will enter the actual German hangars. It has been possible to improve their economy, but their tonnage, and consequently their radius of action, useful load, maximum attainable height and speed are the same to-day as they were in July last. This radius of action is sufficient not only in times of peace, but also in war time, as evidenced by the Cuxhaven-Yarmouth-Cuxhaven raid. The length of this was 730 kilometres, or equal to a cruise from Frankfurt to Paris and back, or Cologne to London and back. Airships of the same type and carrying the same load can therefore—theoretically, and speaking from the aeronautical point of view—repeat the performance, starting out from a sufficient number of sheds.

“What are these airships? What weight of bombs do they carry? We know that the Germans have naval airships of a known type and of 27,000 c.m. capacity. Let us first attempt to calculate their load of explosives, as this will serve as a basis for the estimates of modern ones.

“Let us state, first of all, that the lessons of experience (the bombardment of Antwerp, Ostend, Ghent, of the Belgian campaign, of Warsaw, Plosk, Nancy, the English coast, and Libau) have up to now been very reassuring. In each case there was no real bombardment, and the cruisers of the air, which were the same in numbers as at Yarmouth (two or three) have dropped few bombs, bombs, moreover, which were of light weight and small effect. There were twelve deaths at Antwerp, not a single one at Ostend or at Ghent, forty deaths from five bombardments in Poland, two at Nancy, four in England. This gives a total of about sixty victims; that is to say, the crews of two large Zeppelins, all in six months of campaigning, and after fourteen attacks, during which period the flotilla lost

The Great War in the Air

at least five units. Nowhere have bombs been found weighing more than 49 kilogs. (this was the weight of a bomb found intact at Yarmouth).

"The estimate of the useful load which a Zeppelin will carry will explain this mystery, which cannot be ascribed to Teutonic modesty.

"The Germans have carefully withheld these figures from us. In the German 'Taschenbuch' of the aerial fleets, the useful load of Zeppelins does not appear. We have, however, fairly exact data to go on. The first were furnished at the time of the landing of Z IV. at Luneville in April, 1913. This airship was of the 19,500 c.m. type (141 m. by 14.8 m.). The total lift was therefore about 20,500 kilogs., but the ship's books showed that the dirigible itself, framework, fabric, motors (three Maybach of 180 h.p. each, and each weighing 448 kilogs.), only left available a lift of 4,800 kilogs., which works out at 23.9 per cent. of the total load.

"From these 4,800 kilogs. must be subtracted 950 kilogs. for the crew (twelve men), and 135 kilogs. of petrol and oil per hour, which makes, for a six hours' cruise (360 kilometres), 810 kilogs. Finally, in order to reach a height of 1,900 m., hardly a sufficient altitude, Z IV., had to jettison 3,000 kilogs. of ballast. The Z IV., therefore, had exhausted its whole useful lift in a six hours' cruise, and covering a distance shorter than that from the nearest German shed to Paris or London and back, without counting projectiles, ammunition, armament and personnel. It can therefore be stated that, except by flying very low, and thus running the risk of being brought down, the Zeppelins of the 19,500 c.m. capacity or less are unable by far to solve the problem.

"It is for this reason that Germany in 1913 constructed types of 22,000 cubic metres capacity, 156 metres long by 14.8 metres diameter, that is to say, of the same diameter of the older ones but with two more ballonets (eighteen ballonets instead of sixteen). The power and weight of the motors is the same, as is also, for all practical purposes, the speed. Nevertheless, the weight of the gas chamber has been increased by two ballonets, and the following estimate can be made. The weight of the gas chamber and of the keel has been increased by about an

Zeppelin Warfare

eighth, a weight which has to be subtracted from the extra lift of 2,600 kilogs. furnished by the increase in cubic capacity. Further, the extra weight of fuel for four hours which is required in order to give the dirigible the necessary range of action for the raid in question (ten hours' cruise of 600 kilometres) has to be subtracted. This is an addition of 540 kilograms, which brings the total weight of fuel up to 1,350 kilometres. A crew of twelve men is insufficient, especially in view of the fact that the dirigible is to be fitted with machine-guns and gunners. The 27,000 cubic metre type had twenty-eight men on board (the number of victims in the catastrophes that overtook L I. and L II.). If in this case we only take eighteen men, that would be an extra load for the crew of 500 kilogs. Then we must subtract the weight of the machine-guns, of their ammunition, of two searchlights, and of the sheet-steel armouring for the motors, which is two millimetres thick and weighs 14 kilogs. per square metre.

"We therefore see that the 22,000 cubic metre type with full war equipment and bound for Paris or London cannot carry anything like a ton of explosives."

It must be remembered, however, that these were only the earliest types of Zeppelins. Excellent and reliable as are the figures of M. Prade, they cannot be expected to give an exact idea of greater properties of lift, speed and duration developed with the later types. Of these there were six which, for purposes of convenience, we will refer to by numbers, from one to six. The first type was of the super-Zeppelin class, that contained elements both of the Zeppelin and the Schutte-Lanz ships.

It was constructed at the Zeppelin works, Friedrichshaven, and Mannheim :

<i>Length</i>	...	...	...	630 feet.
<i>Capacity</i>	...	...	...	1,906,200 cubic feet.
<i>Useful lift</i>	...	...	...	19 tons.
<i>Engines</i>	...	...	...	Six 250 h.p. 6-cylinder Maybach.
<i>Maximum speed</i>	...	...	...	65 m.p.h.
<i>Endurance</i>	...	...	...	35 hours.

The Great War in the Air

<i>Maximum altitude</i>	...	16,500 feet.
<i>Complement</i>	...	22.
<i>Armament</i>	...	6 maxim guns.

Class 2 was constructed at Friedrichshaven and Rheinau :

<i>Length</i>	...	775 feet.
<i>Capacity</i>	...	2,471,000 cubic feet.
<i>Useful lift</i>	...	28 tons.
<i>Engines</i>	...	Seven 250 h.p. Maybach.
<i>Maximum speed</i>	...	68 miles.
<i>Endurance</i>	...	40 hours.
<i>Complement</i>	...	22.
<i>Maximum altitude</i>	...	16,500 feet.
<i>Armament</i>	...	6 maxim guns, 4 tons explosives.

Class 3 was constructed at Friedrichshaven and Potsdam :

<i>Length</i>	...	528 feet.
<i>Capacity</i>	...	1,059,000 cubic feet.
<i>Useful lift</i>	...	10 tons.
<i>Engines</i>	...	Five 210 h.p. 6-cylinder Maybach.
<i>Maximum speed</i>	...	53 m.p.h.
<i>Endurance</i>	...	26 hours.
<i>Complement</i>	...	16.
<i>Maximum altitude</i>	...	11,550 feet.
<i>Armament</i>	...	4 maxims, 2 tons bombs.

Class 4 was constructed at Friedrichshaven and Rheinau :

<i>Length</i>	...	560 feet.
<i>Capacity</i>	...	1,235,000 cubic feet.
<i>Useful lift</i>	...	13 tons.
<i>Engines</i>	...	Six 210 h.p. 6-cylinder Maybach.
<i>Maximum speed</i>	...	59 m.p.h.
<i>Endurance</i>	...	30 hours.
<i>Maximum altitude</i>	...	13,200 feet.
<i>Complement</i>	...	18.
<i>Armament</i>	...	6 maxims, 2½ tons of bombs.

Zeppelin Warfare

Class 5 was constructed at Schutte-Lanz factory at Rheinau :

<i>Length</i>	...	...	544 feet.
<i>Capacity</i>	...	...	1,059,000 cubic feet.
<i>Useful lift</i>	...	...	14 tons.
<i>Engines</i>	...	...	4,240 h.p. Mercedes.
<i>Maximum speed</i>	...	...	53 m.p.h.
<i>Endurance</i>	...	...	26 hours.
<i>Maximum altitude</i>	...	...	8,250 feet.
<i>Complement</i>	...	...	16.
<i>Armament</i>	...	...	5 maxims, 1½ tons of bombs.

Class 6, the latest of all, was constructed at the Zeppelin works at Friedrichshaven :

<i>Length</i>	...	...	521 feet.
<i>Capacity</i>	...	...	953,000 cubic feet.
<i>Useful lift</i>	...	...	8 tons.
<i>Engines</i>	...	...	4,219 h.p. 6-cylinder Maybach.
<i>Maximum speed</i>	...	...	50 m.p.h.
<i>Endurance</i>	...	...	26 hours.
<i>Maximum altitude</i>	...	...	8,250 feet.
<i>Complement</i>	...	...	16.
<i>Armament</i>	...	...	4 maxims, 1½ tons of bombs.

The German Aerial Invasion

The German aerial invasion commenced as early as August 3, 1914. On that date an enemy airship first dropped bombs on Luneville, a frontier town of France. It was, however, in these early days more of a guerrilla warfare than one with any definite scheme of attack. Aircraft invariably flew and worked alone. Often no bombs were dropped upon the positions thus visited. To all intents and purposes the German aeronauts were spying out the lie of the land and accustoming themselves to war conditions before embarking upon any definite scheme of campaign. But an unusually sharp lesson at the hands of the French gunners, on August 23, hurriedly made them change these tactics. For on this date the first Zeppelin was brought down in the war. This ship was the Z VIII., the latest to be received by the German Army. She was the sister ship to the Z VII., was 156 metres long, with a

The Great War in the Air

diameter of 14.8 metres, and a capacity of 22,000 cubic metres, fitted with three 180 h.p. Maybach engines. Only five months before—March 31—she had achieved a record in her trial flight, when, during a five-hour trip over Switzerland, she had passed over Mont Senlis, in the Appenzell Alps, at a height of 3,065 metres. Her loss proved a great disaster to the enemy.

However, on the evening of the 28th a Zeppelin was again reported over the battle lines, this time in the vicinity of Zevenaar, on the Dutch frontier, following the course of the Rhine. It was fired on by Dutch soldiers, but succeeded in effecting its escape. Two days later the same craft was seen at Maestricht using searchlights, and eventually disappeared in the direction of the German territory. On September 4, 1914, the French Government reported:

“A Zeppelin airship at 10.30 yesterday evening from the forts on the south side of Antwerp and on the Nethe River. The airship passed over Alost towards Termonde and Ghent, and then returned towards Antwerp and attempted to fly over the town, but the heavy artillery fire kept it outside the outer fortifications. At 3.30 this morning five or six bombs were thrown from the car. The ship then flew in the direction of —, where a bomb was dropped near the station. It then proceeded towards —. Seven bombs were dropped in the Parc du Rossignol, close to some houses where some hospitals were established. The houses, which were flying Red Cross flags, were damaged. Ten or twelve persons were slightly wounded.

“The airship’s evolutions took ten minutes. The projectiles were different from those used on the former occasion. The bombs thrown to-day were covered by thin envelopes held together with mushroom-shaped rivets. They were filled with special bullets, calculated to inflict horrible wounds. Such a type of bomb has never been used by artillery, and is completely unknown to them. It is made on the same model as that used by the notorious Bonnot robber band in France.”

From this date there was little pause in the Zeppelin campaign, and, though the Germans endeavoured hard to keep secret the number of these craft that had already been destroyed, reference to the various communiqués of this period discloses

Zeppelin Warfare

many losses. Two, for instance, had certainly been destroyed by the British raid on Düsseldorf; and through their secret service the French authorities learnt that Count Zeppelin had received orders to replace them immediately. A double shift of highly skilled mechanics was working night and day at Friedrichshaven to complete two further very powerful ships. All over the country, and particularly at Düsseldorf and Hamburg, new works were being hastily constructed for the building of airships, under the personal supervision of the inventor. In the middle of October Zeppelin was paying flying visits to Friedrichshaven (across the Swiss frontier from Constance), supervising further construction efforts. Any foreigner approaching these sheds was promptly arrested. And the engineers and workmen were already openly boasting that the more powerful new Zeppelin "could remain in the air indefinitely, and was to be used for raiding London."

Enemy Exaggeration

In view of these many exaggerations on the enemy's part (almost all of them cleverly issued to the neutral Press for purposes of propaganda), it is interesting to note a few remarks on the part of the official Eye-Witness at British headquarters, in which he says: "In view of the many statements being made in the Press as to the use of Zeppelins against us, it is interesting to note that the Royal Flying Corps, who have been out on reconnaissances on every day since their arrival in France, have never seen a Zeppelin, though airships of a non-rigid type have been seen on two occasions. Near the Marne, late one evening, two such were observed over the German forces. Aeroplanes were dispatched against them, but in the darkness our pilots were uncertain of the airships' nationality and did not attack. It was afterwards made clear that they could not have been French. A week later an officer reconnoitring to the flank saw an airship over the German forces and opposite the French. It had no distinguishing mark, and was assumed to belong to the latter, though it is now known that it also must have been a German craft. The orders of the Royal Flying Corps are to attack Zeppelins at once, and there is some disappointment at the absence of those targets."

The Great War in the Air

Later events were to prove this statement beyond all doubt. But, though not operating actually over the British front, Zeppelins were busily at work, both to the north, raiding the Belgian coast towns, and also the French provinces to the south. Ostend was the first town to be "raided," in the later meaning of the word. And in this action the Germans, curiously enough, dropped their first bombs wrapped in blankets of a heavy woollen khaki colour, bound with white, some 7 feet or 8 feet long and 3 feet wide. A single ship sailed over Ostend after eleven o'clock one night and dropped several bombs. The first fell harmlessly in the Bois de Boulogne; the second more harmlessly in the sea. The third hit the fish market, which was, of course, at that time of night deserted, and smashed a considerable quantity of lath and plaster into splinters and dust. A fourth bomb buried itself in the turf of a garden adjoining the station, digging a deep hole. The force of the explosion broke some glass in the sleeping-carriage depot. Two rails, each weighing 52 kilograms, were torn up, twisted, broken, and hurled a distance of 250 metres. Small pieces of another bomb were discovered on the Belgian mail steamer *Leopold II*. As to the bombs, two of which were found unexploded at Waereghem, they were described at 21 c.m. (about $8\frac{1}{4}$ inches) in diameter and 1.2 metres (about 4 feet) long. They were made of steel and charged with picric acid.

A good deal of glass was shattered in neighbouring buildings, and telegraph wires were broken down, but no one was hurt, and the total damage did not amount to more than a few pounds. The last bomb was dropped about 11.20. Though the night was very clear and the drumming of the airships' engines seemed directly overhead and was very loud (much louder than that made by any aeroplane), it was impossible to distinguish the craft against the starlit sky. During some few minutes, as the airship receded after the bombs were dropped, there continued a series of flashes, not unlike miniature lightning flashes, at no great height in the air. Finally, the airship returned in the direction whence it came, and was reported as passing over Thielt at 11.40 or thereabouts and Courtrai at 11.55. On account of this visit orders were issued that no light should be shown after dark in Flanders and Campine.

Zeppelin Warfare

The next Zeppelin raid, strangely enough, is a most pleasant instance to recount. It is pleasant in that it signalled the first step towards that wonderful code of rules and laws—unwritten and unspoken—that were afterwards to develop among the air-men of all the belligerent nations, thus to prove the one redeeming feature of Germany at war. During a Zeppelin raid on one of the smaller French provincial towns was found, attached to one of the bombs, the following note concerning the fate of four French aviators who had recently been captured by the enemy. The German signed his name as Hans Steffen, Lieutenant Aviator. "They are quite well," he wrote, "and it is at their request that I write this letter. As to the bombs, I regret infinitely, but it is war. Au revoir, Parisians."

Thus far, however, we have only seen the Zeppelins at work over land, and, if the truth be known, that was far from being their natural element. For sea work they were to prove as much, if not more, at home even than the surface craft. Somehow the sea seemed to be more their natural element; as later events went to prove, they were to be of much greater service to the navy than to the army. While the German fleet lay dormant in the Kiel Canal, it was the airships that carried on the enemy patrols over the North Sea. They figured in almost every naval engagement of the war. Three times at least they saved their High Seas Fleet from being surrounded by the British Navy, and even the notorious Admiral von Tirpitz himself admits their usefulness in this respect: "I am personally of the opinion that aeroplanes are also extraordinarily well suited to naval warfare. But Zeppelins are far superior to them for carrying heavy cargoes of bombs over long distances. The Zeppelins in our navy have remained without a rival, and even now they are being got ready for an extensive invasion of England." The ships were, in fact, already making numerous trial trips over the North Sea for this purpose. On September 28 Zeppelins were reported to have been seen at Loenstrupp and Skaw in Jutland and at Turnhout. In the last case the Zeppelin was said to be proceeding in the direction of Antwerp. Two months later they had ventured as far afield as fourteen miles west of Dunkirk.

CHAPTER VIII

THE R.N.A.S. IN ACTION

Co-operation with the Royal Flying Corps—Seaplanes at the Sinking of the *Blücher*—The Christmas Day Raid on Cuxhaven—The Germans offer £1,000 for Commander Samson, R.N., dead or alive—Düsseldorf—The Strange Story of a British Naval Pilot's Lunch at a German Aerodrome—Bombing the Zeppelin Sheds at Brussels—Flight Sub-Lieutenant R. A. J. Warneford, V.C.—Seaplanes at the Dardanelles—Was the Navy Justified in Loaning so many Aeroplanes to the R.F.C.

WAS the Navy justified in loaning so many of its finest aeroplane squadrons for co-operation with the armies in the field? It is a question inevitably to arise from a close study of aerial operations at this period. As always, it is for the layman dangerous to tread upon the ground of the highly trained and skilled expert. Where, to the one, prevailing conditions and dispositions form the basis of his policy, those same facts must of necessity be suppressed from the outer world. Yet, when one considers that already the whole of the gigantic task of holding the Belgian coast against the arrayed might of the German Navy devolved upon the shoulders of the naval aviators, and, in addition, they supplied squadrons to work with the R.F.C. on the battle fronts, the query assumes some show of legitimacy. The answer can only be supplied by a further comparison of military and naval aerial effort, and of the latter in particular.

Though home defence was the first object of the pilots of the R.N.A.S., they were, in addition, responsible for the conveying of troops across the Channel, and sea patrols from the north of Scotland to as far south as German South-West Africa, and as far east as India. This in itself was a tremendous problem, but it must be remembered that the Navy was better supplied with a greater number of varied craft. The airships, though of unusual value in escorting the troopships of the

The R.N.A.S. in Action

original B.E.F., were also responsible in no small degree for the defence of British shores against enemy raiding aircraft. Thus, on September 11, we find that the Secretary of the Admiralty announced "it has been decided that one of the British naval airships shall make short cruises over London during the next few days by day and by night. There is no necessity for the public to be alarmed at the sight of the airship, and on no account should any attempt be made to fire on it."

And again, a few days later, concerning the work of the seaplanes there appears another official notice to the effect that : "In connection with the aerial defence of England, and of London particularly, which is in the hands of our Navy, seaplanes are constantly patrolling the East Coast on the lookout for hostile aircraft, searchlights being employed at night. Guns for defence against aircraft have been for some time erected on the roofs of Government buildings and other places that might be the special objects of attack, and a reserve of aeroplanes is near at hand to attack at once any hostile aircraft." The seaplanes, as a matter of fact, were already very busy in many theatres of war, both ashore and afloat. The *Hermes*, seaplane carrying ship, was torpedoed by a German submarine in the Channel towards the end of October. The vessel, which was of the "Highflyer" class, had played an important part in the development of the seaplane to its present state of reliability and practicability, and, at the time of the disaster, was taking its part in assisting the army to break the advance of the Germans along the sandy Belgian coast. The following January the sea craft were to make history by participating in the first great naval engagement of the war, being particularly in evidence at the sinking of the German light cruiser *Blücher*.

Seaplanes in Action

The seaplanes were the first to sight the enemy vessels. From the first hour of the dawn they were patrolling far out over the sea, and at eight of a Sunday morning they were the first to bring word of the German fleet's approach. Throughout the four hours of the raging battle the naval aviators were

The Great War in the Air

continuously circling round overhead, but encountered no resistance until the closing and most glorious incident of the day. The great *Blücher* had already been badly holed by the British gunnery, and she was fast settling down, when, suddenly, some half a dozen Taubes appeared against the eastern sky. By a strange coincidence, however, they made no attempt to attack the British forces, concentrating their attempts upon the helpless *Blücher*. According to the evidence of a German prisoner, mistaking her for a British vessel, they dropped bombs on her and hastened her end. This amazing occurrence is best summed up in the words of a British sailor present at the action. Says this officer: "We were about 300 yards away, and watched her go down, and I was particularly struck with the ease and slowness with which she sank. Not till the waves had almost entirely closed over her did the bow heave slightly out of the water, and she disappeared stern first. While the boats were rescuing the survivors a Zeppelin and a Taube put in an appearance. The Taube dropped about three bombs, one of which fell among the drowning men, and literally blew four of them to pieces. I suppose the idea of our rescuing our enemy was beyond the understanding of the cultured pilot of that machine. But, oh! it must have been a rude awakening to him when he returned to find that it was one of their own ships he saw sinking, and his own countrymen that he had killed. . . . Never before has there been a naval battle to equal it in intensity. A battle which raged four hours between ships of such enormous size and destructive qualities, steaming at thirty knots the whole time, and with aircraft and submarines taking part, is most certainly without parallel in the history of the world." Then, as though not content with the damage they had already wrought, the German airmen—closely pursued by the British seaplanes—took it into their heads to attack the fleeing German ships.

That peculiar natural advantage possessed by a seaplane pilot of being able to see distinctly several feet below the surface of the water was to render his services invaluable in the matter of both submarine chasing and mine detecting. Squadron Commander Bigsworth, R.N., distinguished himself quite early in the war with a memorable single-handed encounter

The R.N.A.S. in Action

with a German submarine. The commander surprised the German browsing lazily on the surface of the water. He dropped a bomb, but it missed its mark; the enemy hurriedly dived, and he gave chase. For mile after mile the pursuit continued, the underseas craft blithely unaware of the other's vicinity, until, presently, now deeming himself safe, the commander came to the surface for a breather. But he went down at a considerably faster rate than he came up, and with a huge rent in the side of his craft. The British bomb had found its mark, and all that now remained of the sea prowler was a large, ugly, oily patch on the surface of the water. Mine spotting was also not without its adventures. Another seaplane pilot was brought down one day by a faulty engine in the middle of the North Sea. He set cheerily to work with his observer to effect the necessary repairs, and it was not until later that they discovered they had landed in a minefield. On all sides sinister brown heads reared themselves in the smooth surface. The position was desperate. All that day they waited for a sight of a friendly funnel, but nothing came, only an enemy destroyer, that sniffed at them from a distance, attempted a shot or two, and then disappeared towards the haze of the Belgian coast. The following day was a repetition of the first. As a last resort, the pilot sent off a homing pigeon with an urgent request attached to its wing, and, in response to this fervent appeal, there appeared the third morning a British trawler at the far edge of the minefield. After a daring passage through the mines, they were taken off in a small boat.

If every navy in the world had supplied ships for the patrol of the North Sea in those days of war, they would have proved insufficient for the task of preventing the German vessels from getting out to sea. As it was, the British Navy did wonderful work, despite the fact that the severe gales of winter 1914-15, often prevented the surface craft from putting out from harbour. Then it was that the seaplanes carried on. No gale however fierce was sufficient to daunt those fearless pilots. They patrolled not only the British but many miles of the German coast as well. When occasion demanded, they went yet farther, and bombed the enemy in his own harbours. They bombed German ammunition dumps, concentrations, stations, railway

The Great War in the Air

junctions, army and navy headquarters, docks, harbours, sea patrols, destroyers, submarines and their bases, German merchant shipping that was endeavouring to run the gauntlet of the British surface patrols, and, on several occasions, the High Seas Fleet itself.

The Christmas Raid on Cuxhaven

The crowning incident of the seaplane campaign at this time, however, was undoubtedly the Christmas Day raid on Cuxhaven. At dawn seven seaplanes flew from a certain point on the East Coast to rendezvous at a point described as "in the vicinity of Heligoland." Accompanied by a fleet of light cruisers and several submarines, they thence pushed off for the Schilling roads off Cuxhaven, where some German warships were lying. The cruisers waited some miles off the shore, where they were sighted from Heligoland, and attacked by four German seaplanes, two Zeppelins, and several submarines. The seaplane bombs shaved several of the British vessels by inches, but the Zeppelins were easily put to flight by the guns of the *Arethusa* and the *Undaunted*. The seaplanes, having dropped their bombs, returned to the island for more, and before their reappearance the majority of the British seaplanes had returned to their parent ships. Meanwhile, in Cuxhaven harbour was taking place one of the most daring air raids of the war. Accompanied by the submarines, that were later to pick them up out of the water, the pilots drove on through the thick shore fog, bombed the German warships and destroyed one of the Zeppelin sheds outside the town. Three of the light cruisers dashed in and destroyed the now abandoned British aircraft, and their crews were picked up by the submarines. Of all the pilots that set out, but one failed to return. Flight-Commander Hewlett, having engine trouble, was forced to descend on the sea surface, was rescued by a Dutch trawler and after some question of internment in Holland, that was decided by the fact that he was "a shipwrecked mariner," returned to England a few days later. Thus a most disastrous raid to the enemy was carried out without casualty.

In the light of these extraordinarily varied incidents, then it would at first sight appear that the Navy could spare bu

The R.N.A.S. in Action

little assistance to the military. At one time, to counter all the continuous activity on the enemy's part—less important encounters were taking place every day out over the grey wastes of the North Sea—and to maintain an incessant naval patrol that was in mileage several times the circumference of the earth, was a task in itself that demanded the undivided attention of an entire service. But when it is considered that in none of these actions is there any recorded use of aeroplanes—airships and seaplanes are specifically stated—it may be understood why the majority of the latter craft were at this period working from bases ashore.

German Aircraft Concentration

The strategic value of the Belgian coast warranted all the high hopes set by the enemy in the holding of it. Almost every port afforded an excellent submarine base; and it was within a three hours' flight of Great Britain by a speedy aircraft. It is no exaggeration to say that the Germans were concentrating all of their aircraft effort immediately behind Ostend. From the sea to the south of Lille an aerodrome could now be found to almost every five square miles. Ideally placed, the enemy could make use of these aerodromes both for tactical purposes along the Western Front and also for strategic operations on England. The battle for the mastery of the air in this locality waxed fierce and desperate. Raid and counter-raid were the order of the day. On the one hand it was essential to the enemy that the development of his new submarine bases should proceed unimpeded; on the other it was equally vital that Calais and Boulogne, the great ports of cross-Channel transport, should be kept free from the attentions of German airmen.

From the first official statement issued by the Admiralty, although it is impossible to deduce but the baldest information, reading between the lines it could be discovered that a vast amount of useful work had been carried out during the period mentioned—September 1 to October 8—by the naval aeroplanes. In addition to the highly successful raids on Düsseldorf and Cologne, which achieved no inconsiderable moral effect on the German civilian population, they had been engaged in in-

The Great War in the Air

numerable reconnaissances, and in a number of skirmishes notably at Cassel, Savy, Aniche and Orchies. Also, they had helped pretty considerably to stem the German rush through the north of France. These operations were for the most part under the leadership of Commander C. R. Samson and Squadron-Commander Spencer Grey.

The former was the *bête noire* of the German aerial commanders in this locality. A thousand pounds was offered for his capture, dead or alive, for Samson's daring raids exceeded even the wildest flight of Teuton imagination. One typical instance includes a singularly daring and protracted visit over the German lines. Leaving his base early in the morning, he made for the direction of Ypres and Courtrai. The temperature was well below freezing point, and no opponent airmen ventured up under such conditions. Flying low, Commander Samson dropped several bombs on a squadron of cavalry which quickly dispersed, leaving many dead and wounded. Despite a furious bombardment from shrapnel and anti-aircraft guns, however, the daring airman continued on his way well into the heart of the enemy country, and dropped bombs on the railway lines south of Bruges. Then, satisfied with his morning's work, he returned unharmed and took a little "exercise" on horseback.

Much Bombed Dunkirk

During this period the German airmen were attacking Dunkirk, where the R.N.A.S. headquarters were situated without cessation. Midday was their favourite hour for a visit. So much so that midday was no longer known as twelve o'clock, but as "Taube o'clock." Half-past twelve was the *Taube et demi*, and so on. But now for a spell the enemy took it into their heads to confine their attentions to towns farth inland. A few days later six bombs were dropped on Hazebrouck. Two bombs fell near the station, another in a private garden. Later came the bombing of Cassel, the town on the hill, where a woman and a child were killed. The same day similar visits were paid to Poperinghe, which, as the town lies immediately behind Ypres, was full of Allied troops, but no lives were lost; while at Amiens fifteen bombs were let fall.

But the enemy were soon to regret most bitterly those f

The R.N.A.S. in Action

aimless aerial sorties. Raid for raid they were paid out in their turn by the British naval aviators. Even, one might say the R.N.A.S. motto was not so much "An eye for an eye," but "For an eye, as many eyes as possible." They carried this war of retribution far and wide into the enemy's own country, and achieved most excellent results both from a military and a moral point of view. Their blowing up of important railway junctions and destruction of ammunition dumps hampered considerably the German main advance. The panic caused among the German civilian population was cleverly turned to account by their Governments to kindle anew the hatred of England, and pave the way for the extensive German aerial campaign on this country that was to come.

The personal factor was all through predominant. The deeds of the naval pilots themselves in these few months are sufficient for a separate history. And, as a glorious climax, was Flight Sub-Lieutenant Warneford's single-handed attack on a Zeppelin. Meanwhile the war of attrition went well forward. On December 20, Commander Samson, and on the 24th, Commander Davies, bombed Brussels. Great havoc was wrought by the latter on the flying-ground at Etterbeck, twelve bombs being dropped in all. The effect of these raids, however, was more moral than military. And in this respect, as confidential information from Brussels was to show, they achieved indeed a very useful victory. Some weeks later the Admiralty published the first official reference to the great raid on Friedrichshaven, in which they stated baldly: "It is believed that the damage caused by this attack includes the destruction of one airship and serious damage to the larger shed, and also the demolition of the hydrogen-producing plant, which had only lately been completed. Later reports stated that flames of considerable magnitude were seen issuing from the factory immediately after the raid." Three days after the Etterbeck raid, nine Allied aeroplanes, British, French, and Belgian, visited Ostend. Considerable damage was effected with bombs dropped on the railway station and military barracks. On their homeward flight, however, the Allied machines encountered a strong enemy squadron. One of the British machines was hit in nine places, but without impairing its immediate efficiency. From

The Great War in the Air

his machine no fewer than eighteen bombs and half a dozen grenades were dropped on German military works and railway centres.

Yet, once again the Admiralty reported: "British aeroplanes of the Naval Wing delivered an attack on the Zeppelin sheds at Düsseldorf.

"The conditions were rendered very difficult by the misty weather, but Flight-Lieutenant Collet dropped three bombs on the Zeppelin sheds, approaching within four hundred feet.

"The extent of the damage done is not known.

"Flight Lieutenant Collet's machine was struck by one projectile, but all the machines returned safely to their point of departure.

"The importance of this incident lies in the fact that it shows that in the event of further bombs being dropped into Antwerp or other Belgian towns, measures of reprisal can certainly be adopted, if desired, to almost any extent."

Apparently the German commanders took the hint; for several weeks no more attempts were made on Allied positions. But this in no way brought a cessation to the Allies' raids. On March 24 a successful air attack was carried out by five machines of the Dunkirk squadron on the German submarines under construction at Hoboken, near Antwerp. Two of the pilots had to return owing to thick weather, but Squadron-Commander Ivor T. Courtney and Flight-Lieutenant H. Rosher reached their objective and, after planing down to 1,000 feet, dropped four bombs each on the submarines. Considerable damage was done to both the works and two submarines. The works were observed to be on fire. In all, five submarines were observed on the slip. Owing to the mist the two pilots experienced considerable difficulty in finding their way and were subjected to a heavy gun-fire whilst delivering their attack. And in the end one pilot was obliged, by engine trouble, to descend in Holland. The following day the Hoboken slips were again bombed by Lieutenant Andraë, and another pilot, whilst reconnoitring over Zeebrugge, observed two submarines lying alongside the Mole, and attacked them, dropping four bombs. Both raids were carried out by moonlight, and were of the most daring nature.

The R.N.A.S. in Action

Every day brought its quota of wonderful adventures. No two days in succession were similar in the nature of the work carried out. One afternoon a thrilling fight between Allied and German aeroplanes round an enemy captive balloon occurred near Zeebrugge. Since early morning this ugly monstrosity had been aloft in fine weather with a fairly strong wind. The Allied aeroplanes attacked the balloon, but were driven off by the land batteries. Four German aeroplanes went in pursuit, and many shots were exchanged in the air. The machines were skilfully handled in the high wind. One of these, a Taube, fell in the dunes, and two airmen were killed.

A squadron of British warships was cruising off Zeebrugge at the time, and several shots were fired at submarines which attempted to escape into the open, while the Allied aeroplanes, having driven back the Taubes, continued to scout along the coast, where they were shelled at intervals by the concealed batteries in the dunes.

A Lunch with the Germans

A somewhat more amusing adventure was that which befell another naval aviator who was a prisoner in German hands for three days. During the bombardment of the German right wing by the British monitors he was directing the fire of the British cruisers, and was hit by a German bullet and forced to descend in hostile territory. He could see no enemy, and was preparing to escape when he heard a German voice say in quite good English: "Hi! Where the hell are you going to? Come and have lunch."

The British pilot had no option but to obey. He went with his captor and had a good lunch. The Germans treated him well, and three days afterwards he escaped during a night attack, in which the enemy was forced to retreat hastily.

The nature of this thrilling work by air can best be summed up in the words of one of the pilots participating. "For the past three weeks," he said, "I have been so busy on reconnaissance patrols, that during that time I have not even been able to change my clothes or wash myself.

"I had two machines disabled by rifle and shell fire, whilst

The Great War in the Air

a third caught fire in mid-air. On each of these occasions I very narrowly escaped a fatal disaster.

"Once, when I came down after a long period of flying, I was so exhausted that I lay with my head on my aeroplane and fell fast asleep. On waking I was surprised to find that my puttee, boot, and sock of one leg had been removed by some fool who was evidently on the look out for souvenirs."

The Zeppelin Sheds at Evere

Of all these individual exploits, however, no one had yet equalled, not one was ever to excel, that concerned with a certain bombing expedition which set out one summer morning of 1915, for the Zeppelin sheds at Evere. It was a simple enough incident of a daily routine, but it was destined to disclose a personality and a career at once the most dramatic and tragic of the whole war. Under a starlit sky, in the cold dreary hours of the night, the lithe, sinister forms of three British aeroplanes winged their way eastward from Dunkirk air station, disappearing into the night. The names of two of the gallant airmen were Lieutenant J. P. Wilson and Lieutenant J. S. Mills, and all were bound for the new Zeppelin sheds outside Brussels. The Zeppelin campaign was already beginning to make itself felt in Great Britain. Mr. Winston Churchill's "hornets which were to drive off all enemy raiding aircraft immediately on sight" had failed to materialise. Anti-aircraft guns had thus far proved inefficient to meet these novel and trying conditions. Loud outcry for better protection was being made to the British Government by Press and public alike. Orders were immediately flashed out to the naval air squadron at Dunkirk that the Zeppelin bases in Belgium must be destroyed at all cost. And so, this starlight night, the three daring adventurers found themselves under way on this dangerous and thankless task.

Setting their course between Brussels and the sea, they sped along and along the coast. The night was hung with stars, which reflected in vague grey outline the contour of the slumbering countryside beneath. A wee winding ribbon of dull silver, shimmering in the half-light, a river trickled away into the obscurity of the horizon. Myriads of tiny lights

The R.N.A.S. in Action

twinkled and mysteriously disappeared in numerous towns and villages as the British airmen flew rapidly by overhead. A sudden column of smoke shot up into the night as some heavily laden troop-train pounded its way eastward, with its sweating human cargo for the battle lines. The sea, a sharply defined element of space, touched with silver grey, shimmered occasionally through the half-lights on the port side of the speeding aircraft. And then, suddenly, the daring airmen were enveloped in a sea of quite another sort. Great rolling banks of grey fog clung to the sky on all hands. Like magic the face of earth and sea and sky were blotted out from sight. They were rushing on headlong into a nightmare of obscurity. When eventually the stars again shone through the sweeping mists overhead, only Mills and Wilson remained. The third man had disappeared.

Bombed on the Ground

But this was no moment for vain regrets. They had their mission to accomplish; their orders must be carried out "at all cost." Such sympathy as they must have extended to their now absent comrade had perforce to be stifled at the call of duty; Mills and Wilson kept on their way. At last the roofs and buildings of the great city of Brussels lay at their feet, bathed in a sea of silver mist. The Evere airship shed, to the north of the town, stood out distinctly, a long, lean mammoth of black against the shadowy background. It could not be missed. But only one Zeppelin was in the hangar at the time. The other was reconnoitring somewhere away up the Belgian coast.

At two-thirty in the morning the two pilots took up station for a bombing attack. Still favoured by the mist, they commenced to manoeuvre over the town very high and slowly, in wide circles, striving to locate the exact position of the Zeppelin hangar. Every anti-aircraft gun in the vicinity immediately belched into action. And, cloaked by this murderous barrage, in which it would seem no aircraft could dare and live, the German mechanics made frantic efforts to get the Zeppelin out of its shed. Barely had it emerged a few yards, however, when the British airmen made a sudden dive straight down to

The Great War in the Air

within a few hundred yards of the sheds and dropped their bombs, which exploded with terrific reports. A few seconds later the airship blew up with a still louder report, while huge tongues of flame shot into the air from the blazing hangar, followed by lesser fires as five Taubes, also in the same shed, went up in flames. The two British airmen immediately turned for home, and reached Dunkirk without adventure.

The Great Deed of Lieutenant Warneford

Meanwhile, the other Zeppelin commander of Evere, unaware of the catastrophe which had visited the sheds during his absence, and having completed an entirely satisfactory reconnaissance, turned leisurely for home, keeping over the Flanders coast the while. The dawn was just beginning to break, and the upper altitudes—he was flying at 6,000 feet—were already flooded with light; so he determined upon a farther reconnaissance inland. It was to prove a most unfortunate choice. Imagining themselves invincible to attack from the air, no look out was kept. And it was quite by chance that one of the crew suddenly sighted the lithe, mosquito-like form of an aeroplane hovering 2,000 feet overhead. At first the German commander imagined it to be a Taube that, unknown to himself, had followed them. Then, suddenly, he commenced to give hurried orders to his men to take station. The gun-crew raced up the narrow iron ladder which led to the machine-gun platform on the roof of the craft. Reflected in the rays of the rising sun through his glasses, by this time could be seen distinctly the red, white, and blue circles on the fuselage and wings of the approaching plane. For this was the third British machine, that had got lost in the fog, and its pilot was none other than the world-renowned Flight Sub-Lieutenant R. A. Warneford.

After twenty terrible minutes groping his way through the blinding fog, he had eventually emerged into open sky, somewhere in the vicinity of Ghent. His companions were no longer in sight, and, in vain searching round for some minutes, he reluctantly turned for home, making his way out toward the coast. But barely had he sped five miles when he saw a long, sinister form suspended against the horizon; something

The R.N.A.S. in Action

that made his eyes open wide with astonishment. A Zepp! And below him; just in an ideal position for an attack. It was too good to be true. It must be some optical delusion of the early dawn. But no! As he searched again eagerly, he commenced hurriedly to climb his machine up into the sky. Something went hurtling by into space, through the clear morning air with a soft purring whir. The enemy had opened fire; the grim, terrible battle of the skies was begun. In those next tense ten minutes history was to be made, which would leave the whole civilised world breathless with astonishment and admiration.

Like a bantam paused to strike, the tiny plane hovered overhead of the great bulk of the airship. The gunfire from the latter was, by this time, little short of murderous, and she was making for home as fast as her engines would carry her. Then, a Nemesis from the clouds, the aeroplane pilot swept down in a sudden daring, headlong dive for the giant Zeppelin. As he came, his bombs fell one after another, punctuated only by the briefest intervals. One—two; both went far wide of the mark. Three—four! It seemed as though he could never hit her. He must risk everything now in one last desperate attempt. He could not, must not let her escape! The fifth; a sudden hissing, downward rush, and again far wide of the mark. Down to within thirty metres of the enemy he swept, resolved to risk everything in this final attempt. He could see the white, scared faces of the crew on the upper gun-platform; the whole craft now seemed paralysed with fear. She hardly appeared to move through the air. Gently, carefully, almost tenderly, he nursed that one remaining bomb until he was dead over the enemy ship and it was impossible to miss her. Another thirty seconds flashed by. Then, suddenly, with the full force of a tornado, his frail craft was flung ruthlessly from side to side, up and down, now this way, now that. Followed one great blinding flash; the next moment the terrific force of the explosion sent him reeling on to his back. Involuntarily he looped two or three times. Some minutes had passed. And then, at last, regaining a level keel again, far below he could see a blazing funereal pile. The once powerful airship lay a mass of towering, devastating flames on the roof

The Great War in the Air

of the nunnery of Le Grand Béguinage de Sainte Elisabeth, at Mont Saint Armand.

Alas for the luckless inmates! The innocent were indeed paying the grim price of war. The building was burnt down to the ground; a charnel house of dead and dying, whose blood-curdling screams of agony, and the roar of the fire, echoed through the quiet countryside far around; while all that remained of that once proud Zeppelin were twenty-eight blackened, indistinguishable corpses. No single member of her crew survived.

But Warneford's adventures were merely beginning. The involuntary loop had emptied his main petrol tank. Very soon the engine of his monoplane commenced to fail. It was a desperate situation. He was still far over in the enemy's country, and could expect but scant mercy after his all too recent exploit with the giant airship. He made desperate efforts to continue on his way, but all to no avail. In the end he was forced to come down with a rush, and landed in a large meadow beside a high-road. Fortunately no enemy troops were in sight. Hurriedly, and as best he could, he attempted to effect the necessary adjustments, and was so successful that within fifteen minutes he had got his engine starting again. Then, when at last he was safely in his seat, ready to rise, some enemy cavalry came into view beyond the distant hedge. With one mighty zoom he was up and into the sky. Soon he was skimming far over the sea, at least safe from pursuit for the time being. For almost half an hour he continued thus. When eventually he did turn for the shore he found that he had completely lost his bearings. Dunkirk and Calais had been passed unnoticed in the sea mist; and he came to earth at Cape Grisnez at 4 A.M. of the morning of June 7, 1915. And still his adventures were not ended. As he landed his machine was surrounded by hostile French peasants, who imagined him to be a spy. And he was only released after having made a long journey to a British base to prove his identity.

Events now began to move rapidly. The news of the glorious exploit was being flashed to every far corner of the civilised globe. By midday Warneford, V.C., was the best known figure of the war. London gasped; New York was breathlessly

The R.N.A.S. in Action

thrilled; Paris in a mad ecstasy at this first dire disaster to the German airships—Paris had suffered very severely at the hands of these same Zeppelin commanders. And what of the destroyer himself? Having handed in a brief report he went to bed and slept for several hours. Meanwhile, congratulations began pouring in on him from all sides. Though the British Admiralty found all that they had to say in: "At three o'clock this morning Flight Sub-Lieutenant R. A. J. Warneford, R.N., attacked a Zeppelin in the air between Ghent and Brussels at 6,000 feet. He dropped six bombs, and the airship exploded, fell to the ground, and burnt for a considerable time. The force of the explosion caused the Morane monoplane to turn upside down. The pilot succeeded in righting the machine, but had to make a forced landing in the enemy's country. However, he was able to restart his engine, and returned safely to his aerodrome." Within twenty-four hours—a record for the award of the Cross—H.M. King George had wired him personally: "I most heartily congratulate you upon your achievement in which you, single-handed, destroyed an enemy Zeppelin. I have much pleasure in conferring upon you the Victoria Cross for this gallant act.—GEORGE, R.I." And the official announcement of the V.C. ran: "For most conspicuous bravery, when he attacked and, single-handed, destroyed a Zeppelin in mid-air." This award was immediately followed by the Order of the Legion of Honour that was handed to Warneford by the French Minister of War in person. Honours came showering on him from all sides, when, at the height of his fame (June 17th), the whole world was startled with the announcement that "Flight Sub-Lieutenant Warneford, V.C., had been killed while flying at Paris." It was not quite a fortnight to the day of his great deed off the Flanders coast. And, whatever may have been the reason of that tragic accident, in which both the airman and Needham, an American journalist, were killed, it can find no place in this brief history.

Aircraft in the Dardanelles

The main centre of naval aircraft activity, meanwhile, had by this time been transferred from Belgium to the Dardanelles. On February 19th appeared the first official announcement that

The Great War in the Air

aircraft were assisting at the bombardment of the Dardanelles forts by a combined British and French fleet. The assistance thus given was to prove of an invaluable nature, and to mark the first entrance of aircraft as a definite arm in naval operations. The great part they had to play in the disastrous landing at Gallipoli, perhaps, will never be known; so much of the data was lost in evacuation.

The majority of these operations were directed from the *Ark Royal*, the new seaplane-carrying ship, and it was the brief Admiralty announcement that "His Majesty's aeroplane-ship *Ark Royal* is in attendance, with a number of seaplanes and aeroplanes of the Naval Wing" that gave the public the first hint that any British aircraft were in the locality. It was a most dramatic entrance, to say the least of it. The *Ark*, as she was popularly known, had proved one of the two surprises of the Naval Estimates of 1914-15. She was the first of her kind, was built by the Blyth Shipbuilding and Engineering Company, and was devoted exclusively to seaplane-carrying. However, after that first announcement in the Estimates, she was completely lost sight of until the opening of the Gallipoli campaign. She was specially constructed for the purpose of launching seaplanes at sea, with a funnel set far aft and a long open foredeck on which were quartered the seaplanes, with two large cranes to set them down on, and lift them from, the surface of the water. Formerly this class of work was consigned to obsolete cruisers. Steaming always at a reduced rate of speed, and frequently anchoring to pick up returning aircraft, the "carrier" offered an all too easy mark to enemy submarines. Though at the historic air raid on Cuxhaven three "carriers" were employed, all of them pre-war cross-Channel steamships specially converted to this purpose, it was yet many months before every fleet and squadron was to be equipped with a similar, but specially constructed, craft. Meanwhile, the *Ark Royal* more than fulfilled the purpose for which it was designed.

Almost every reconnaissance flight and bombing raid on to the peninsula set out from and returned to the seaplane-carrier. Night and day the seaplane pilots never slept. Their work varied from the direction of long-range artillery fire, reconnaissance, and the spotting of new Turkish gun emplacements and

The R.N.A.S. in Action

troop dispositions, to locating surface mines—several hundred of which were sown by the enemy in this narrow channel—and the direction of the 15-inch guns of the *Queen Elizabeth* from one side of the peninsula to the other. All this work was being carried out despite the fact that the equinoctial gales were in full blast, and to accomplish any useful observation the pilots had perforce to fly unusually and dangerously low.

One such flight is recorded in the Admiralty official of March 10. "Owing to the importance of locating the concealed guns the seaplanes have had to fly very low on occasions," admits this report, adding as an example: "On the 4th instant a seaplane (pilot Flight-Lieutenant Garnett, observer Lieutenant-Commander Williamson) became unstable and nose-dived into the sea, both officers being injured. Flight-Lieutenant Douglas, reconnoitring at close quarters in another seaplane, was wounded, but managed to return safely. On the 5th, seaplane No. 172 (pilot Flight-Lieutenant Bromet, with Lieutenant Brown) was hit no fewer than twenty-eight times. . . . The *Ark Royal* is equipped with every appliance necessary for the repair and maintenance of the numerous aircraft she carries." The very difficult atmospheric conditions are obvious from the numerous references of the officials at the time; as, for instance: "On Tuesday seaplane reconnaissance was impossible on account of the weather"; and "Unfavourable weather has interrupted the operations in the Dardanelles, and seaplane reconnaissance has not been possible"; again: "The operations in the Dardanelles are delayed by unfavourable weather. A strong north-easterly gale is blowing, with rain and mist, which would render long-range fire and aeroplane observation difficult"; and again: "No action was possible on March 3 till 2 P.M. when, although the weather was still unfavourable, *Irresistible*, *Albion*, *Prince George* and *Triumph* resumed the attack on Fort Dardanus and the concealed guns in its neighbourhood. These were less active than before, and were dealt with by the ships with more certainty. A useful seaplane reconnaissance located several encampments and two permanent batteries."

And still that original query has not been answered. Was the Navy doing right in loaning all its finest aeroplane

The Great War in the Air

squadrons to the Army? Let us sift the evidence as presented in this last chapter. Dunkirk, the R.N.A.S. headquarters, from the point of view of aerial strategy, was the finest position in any theatre of operations. At one and the same time the naval airmen were able to strike a deadly blow at the enemy's naval campaign, by destroying his, by now, barely accessible submarine and destroyer bases in the North Sea. The Belgian coast was also so geographically situated that it was the nucleus of all the German lines of communication from Lille to the sea; also the centre of his principal ammunition dumps, railway junctions and troop concentrations. These were made the primary objective of the naval airmen; while, at the same time, they participated in the R.F.C. general aerial offensive farther to the south. They played no small part in hampering the German rush through Belgium. From the same base they were able to defend English shores, by raiding the raiders in their lairs and also tackling them *en route*. These few facts speak for themselves.

CHAPTER IX

THE CAVALRY OF THE CLOUDS

The Flying-Man, the Paradox of War—Reorganisation of the R.F.C.—
“Flying Weather”—Reconnaissance, Strategical and Tactical—
Direction of Artillery Fire—Aircraft, at Ypres, save the British
Army from Destruction—The Development of the Aerial Duel—
Personal Experiences of a Battle Pilot—Destroying the German
Lines of Communication—British Air-Raids.

THE student of military affairs will have observed already the marked similarity of the work of the old-time cavalry patrols and that of that latest branch of His Majesty's fighting forces, the reconnaissance aeroplane. It was not yet twelve months since the outbreak of hostilities when the cavalry had already been superseded by the R.F.C., and were, indeed, not too pleasantly engaged in filling sand-bags and digging reserve trenches. The work of a cavalry screen before an advancing army was ended for all time. Working at much greater speed, in correspondingly less time, the objective to the aerial observer stood out in bold relief, where formerly such an observation could only be surmised. Where the one was a not too trustworthy mental picture, coloured by the human imagination, nothing could be more coldly exact and scientifically accurate than the detailed report of the aeroplane observer, sometimes photographed at the same time, while he himself directed the subsequent destruction by the artillery of the objective, and even reported the results of that same destruction. The cavalry had passed into the dim memory of historical pageantry; later, in the air, the reconnaissance pilots were nothing more than modern cavalymen mounted on highly speedy machines. And their first great opportunity presented itself in the spring of 1915, at Neuve Chapelle and the second great battle of Ypres.

The stagnation on the Western Front in the late winter

The Great War in the Air

and early spring, though not affording much opportunity of development of concerted action, found the British airmen tremendously busy. It was somewhat in the nature of guerrilla warfare as far as they were concerned. Up to a point every man was his own commander. He had orders before leaving the ground, but not too definite orders. Should any other objective more promising reveal itself *en route* he was free to use his own judgment. This no doubt developed that spirit of individual action that was to continue as far as aircraft were concerned throughout the whole war. The airman was to prove the paradox of war; a soldier yet a sailor; a daring veteran and, at the same time, a reckless youth; a responsible commander but often an undisciplined junior. If that discipline imposed upon the young and growing R.F.C. did not exactly coincide with the Spartan views of the older army chiefs, it was because they lacked that extreme knowledge of human nature that only flying and its associations affords. And it must be remembered that aerial warfare was, is, and will always be a matter of glorious individual exploits. One can imagine the delicate situation of, say, a major, himself but a mediocre pilot, in command of some brilliant ace of a subaltern of nineteen. But this in no way impaired the efficiency of the Corps as a whole. There can be little doubt, when one considers the difficulties and disadvantages that had to be faced in that first twelve months of the war, that the development of the efficiency of the R.F.C. and the fostering of its new and splendid traditions are little short of amazing.

Anonymous Heroes of the R.F.C.

With the Military Wing, however daring a raid or invaluable a reconnaissance flight carried out, the name of the pilot was never mentioned, save through the official channel of the honours list of the *London Gazette*. This general dislike of self-advertisement and anonymity was fostered as much as possible by wise commanders, who knew only too well the delicate nature of the human material they had to handle. It is no exaggeration to say that the *esprit de corps* and the comradeship of the Flying Corps were unequalled in any branch of the Services. So many tried pens and gifted authors have

The Cavalry of the Clouds

dealt at great length with the subject of the airman himself that this present summary must be at the most perfunctory. The mask-like expression of the face, the conscious steely glance of the eyes, sharpened by long and incessant conflict with every destructive force of Man and Nature alike; in conversation and general outlook on life, the seeming lack of imagination and coherent thought; the markedly strong disinclination to talk of self, might almost be said to have been a pose. Behind that mask, however, burnt incessantly the all-absorbing flame of pulsating Youth. The *joie de vivre* was ever uppermost. How they enjoyed this poor mortal existence, those gallant boys and youths! How they even snatched moments of exquisite pleasure from those tense seconds of danger and disaster in the air! By natural disposition they were but children, paddling curiously on the shores of manhood; by every instance and force of habit they were veterans of long and tried experience; by temperament, that uncanny something that hovers betwixt the artist and the woman. By reason of their services to the country, despite their many delinquencies and lack of discipline, they were one and all "pukka" soldier men. And their courage, as the words of Lieutenant-Colonel Brancker, Assistant Director of Military Aeronautics, himself testify, was magnificent.

Reorganising the R.F.C.

Speaking at a Wilbur Wright memorial lecture at the Aeronautical Society in May, 1915, the Colonel lifted for the first time a corner of the mysterious veil that had so far shrouded the doings of the Royal Flying Corps on the Western Front. Britain put into the field, the Colonel declared, a great number of different types of aeroplanes, and it was soon proved that British design and construction were far superior to those of her Allies and of her enemies; and, backed up by the magnificent courage of her pilots, she quickly established virtual command of the air. Every German pilot who put in an appearance was attacked at once and driven off, until it had become almost the invariable rule that no German would face a British aeroplane.

Immediately afterwards it was announced that the Corps had

The Great War in the Air

been reorganised throughout. The establishments were now as follows :

		Officers.	Rank and File.	Total.
Wing Headquarters	...	3	27	30
Administrative Wing	...	4	14	18
Records and Recruiting	...	2	7	9
Depot		7	239	246

The Wing was the army corps of the R.F.C. It was a self-contained unit that dealt with everything from personnel to administration and repairs; and was provided with its own motor transport. Consisting of two, three, or, in special cases, four squadrons, each wing was under a separate commanding officer. The latter, who was assisted by an adjutant, was responsible for the training and administration of his wing, including accounting for equipment, clothing, and necessaries, and the adjutant was responsible to the commander in all questions of training and discipline.

The adjutant's right-hand man again was the E.O.—equipment officer—who was in charge of all technical stores. His was the uncertain duty of accounting for all technical stores in charge of the wing, making such issues to squadron commanders as were necessary to maintain the equipment of their squadrons.

The personnel was now on enlistment to be sent to the Royal Flying Corps for training. Here they were trained not only in the ordinary duties of a soldier, but also in their technical duties as air-mechanics in the technical section of the Royal Flying Corps depot. From this depot they were drafted to the wings according to requirements. Training at the depot in normal times, was a matter of six months, but during the war this period was considerably curtailed. Promotion to the rank of sergeant could only be made by wing commanders; promotions above the rank of sergeant were based on the recommendations of wing commanders and authorised by the Officer in Charge of Records from a general roll of non-commissioned officers kept by him.

The entire force was organised from the office of the Administrative Wing, which comprised the command of the

The Cavalry of the Clouds

depot, records, reserve aeroplane squadrons and the aircraft park in England. This office was responsible for the final approval of all recruits, and for the recruiting of men specially enlisted during the war; for the allotment of personnel to squadrons, for the dispatch of reinforcements of personnel abroad, and for preparing the monthly statement of allowances and extra pay of all the officers of the Royal Flying Corps; while the post of officer commanding the Royal Flying Corps (Military Wing) was abolished and a new command established at headquarters in the field, from whence provisional establishments for flying headquarters, for the headquarters of the Administrative Wing, and for the Royal Flying Corps depot were issued.

The R.F.C. at St. Omer

Headquarters in the field was at this time centred at St. Omer, together with G.H.Q. Situated on a wide level plateau outside the town—an ideal position for an aerodrome—it was the nerve-centre of a delicate and widespread organisation that extended from one extreme of the line to the other. Here the highly organised intelligence service kept a detailed map of, and an exhaustive record of, the enemy's country, and every movement within his lines. Also a record was kept of every flight and its success or non-success, that is, whether information was obtained and proved to be correct, carefully tabulated for reference. Here, too, were situated the quarters of the aerial wireless section. This section, divided into flights of four machines each, consisted of aeroplanes fitted with wireless telegraphic apparatus capable of transmitting signals to and receiving signals from every air station down the lines.

From headquarters, as far as was practicable, was directed the whole scheme of aerial campaign along the Western Front. The work was still rather of an observational than of a destructive nature; though here and there, as typified by the devastating raids on the Don and Douai railway junctions, March 12 and 13, 1915, the main effort of the R.F.C. was directed towards the identification of enemy positions and emplacements, the spotting of enemy guns, and the direction of our own artillery. Despite the unfavourable, often impos-

The Great War in the Air

sible, weather conditions, the Air Force, as the cavalry of the clouds, developed with great rapidity.

"Flying Weather"

Varying from day to day, "flying weather"—as it was afterwards to be known—did not set in until the end of March. Though later in the war aeroplanes were to prove themselves capable of taking the air in almost any sort of climatic conditions, with the earlier, cruder types of early 1915 flying was frequently impracticable. Fog was probably the airman's worst enemy. Almost every morning the low-lying Flanders country would be shrouded in a dense ground mist that obliterated every landmark. Again, whole districts in southern Belgium were flooded at this time, for the Scheldt, as well as the Lys, had overflowed its banks. These conditions, in addition to tempestuous rainstorms and prevailing high winds, rendered the task of the R.F.C. far from a simple one. On one day, in fact, the wind was blowing so hard that an observer, engaged in photographing a certain area, found himself actually travelling backwards relatively to the ground at the rate of ten miles an hour, though he was on a very fast machine, going ahead at full speed.

However, despite these great hardships, the airmen persisted with praiseworthy determination; carried out their various duties, and co-operation between aviators and artillery was particularly close. Groping his way through the early morning mists, one aviator discovered a hostile ammunition column near La Bassée, and dropped a bomb on it, blowing up an ammunition wagon. Another, in a gale of wind, made a very successful reconnaissance over a section of the German line. Travelling at a low altitude, he not only obtained much useful information, but managed to drop ten bombs on the enemy's trenches. And during an early burst of spring weather—memorable day—practically the whole of a small village, in which was situated the headquarters of an enemy army corps, was obliterated by the valuable co-operation of an artillery observer with the British "heavies." With the same assistance a direct hit was made on a German gun near Frélinghien. A hostile column of infantry, observed from the air on a road

The Cavalry of the Clouds

opposite the British right centre, was subjected to a heavy and disastrous fire.

Reconnaissance, under the heading of which all these latter manœuvres must be included, it will be seen covered a very wide field of activity. There were, generally speaking, two forms, tactical and strategical. It is difficult to draw a hard and fast line between them, or to define exactly where one begins and the other ends; but the former may be said to be undertaken exclusively for the purpose of ascertaining the strength and dispositions of the enemy in a strictly limited area along a battle front, by locating and examining his trenches, gun emplacements, headquarters, reserves, supply parks, and railheads. Its sphere ceases at a comparatively short distance from the front of the opposing forces.

All that is going on in the area far behind the enemy's lines comes within the sphere of strategical reconnaissance, which is undertaken with the object of obtaining information about the enemy in a particular part of the theatre of war, and so enabling a commander to form an idea as to his opponent's designs.

Two Kinds of Reconnaissance

While tactical reconnaissance is chiefly of value to corps or divisional commanders to enable them to know what is in their immediate front and to make their local dispositions accordingly, the higher leading and direction of the larger masses—in a word, the plan of campaign framed by a commander-in-chief and his general staff—depend upon the results of strategical reconnaissance.

The intelligence upon which such plans will be based is that referring to the amount of transport and rolling stock on roads and railways, the strength of columns of troops, the size and situation of bivouacs, parks and supply depots, second lines of defence, and any other facts which may afford a clue to the strength and disposition or movements of an enemy's masses, and to his intentions.

To gather information of this nature by aerial reconnaissance, the observer either travels above a previously selected line of country or passes to and fro over a certain definite area,

The Great War in the Air

noting and recording everything of value that he sees. The latter method is the slower, and is used only when very detailed information is required.

The advent of this new aerial arm was not without its effect, and a drastic one at that, upon the strategy of war in general. In fact, a certain official observer writing at this time records: "It is a truism to say that the introduction of aviation has had a profound effect upon the whole character of military operations. And in no way has it modified war more than by greatly eliminating the element of surprise, for, so long as the weather permits of the employment of aerial reconnaissance, it is impossible for any great concentration or movement of troops to be carried out by day within a certain radius without being discovered.

"Especially in the form of warfare in which both sides are at present engaged is the former function of cavalry as regards reconnaissance usurped by the flying corps."

This effect was perhaps most obvious in the spring of 1915 with regard to aerial tactical manœuvres. And these again may be divided into two main categories, reconnaissance and the direction of artillery. "The effective co-operation of our artillery was due in no small measure to the services of our airmen," Sir John French reported in one of his numerous references to this branch of aviation on March 16. "In the misty weather that prevailed little could be seen by the latter from a height at which they were comparatively safe, and they did not hesitate to accept the greatest risks by descending to a height of only 800 feet above the hostile batteries." Their method of procedure was simple to a degree. A large scale map of the particular area over which the machine was manœuvring was divided into small squares, numbered and lettered. A comparison of map and landmarks thus enabled the observer to gauge the locality of an objective to within a few feet. Having obtained the exact position of the dump or emplacement upon which he was directing the artillery fire, he would wireless the information to the battery commander for whom he was spotting. The batteries were, of course, a considerable distance behind the trenches, and the gunner never saw what target he was aiming at. Yet, with the aid of the

The Cavalry of the Clouds

observer, and by locating the same position on a similar map which he had in his possession, his shells very seldom went astray. Even when he had demolished the particular target upon which he was concentrating, another might be flashed down from the air; and within a very short space of time the operation would be repeated. And in much the same way the aviator, by observing the flash of the gun, could locate the positions of the enemy artillery, and, communicating with our own artillery, have it very soon demolished.

Photography, which, together with aviatational wireless telegraphy, was rapidly assuming a degree of unusual efficiency, also fell to the lot of the reconnaissance pilots and observers. In those early days the cameras employed were the merest amateur's toys compared with the scientifically developed aerophotography equipment of later days. Most of the photos were snapped from a high altitude, for many a bitter lesson had been learnt already by photography machines descending too low and near the German anti-aircraft fire. The reconnaissance observer was expected also to be aware of every development and movement, however insignificant, along the entire front. Headquarters of brigades were being continually changed, and batteries were continually being shifted. The aviator was expected to do his utmost to keep in touch with all such changes.

Every morning they reconnoitred the enemy's country, usually facing a heavy fire of shell, rifle bullets and machine guns. When their reports came in, any change of batteries was noted, and British batteries were ranged on new targets. They were also instrumental in bringing to earth several German captive balloons, which were first used by the enemy about this time for purposes of observation. But their busiest time occurred immediately previous to a British advance. On such occasions the observation planes would be hovering over the enemy lines from dawn until sunset without a break; reconnoitring, directing artillery fire, or helping to divert the enemy's attention from that particular area. And though at Festubert aerial reconnaissance failed to warn the infantry of the deep, wide stream by which they were disastrously held up during the second night of the battle, the assistance rendered by aircraft at the second battle of Ypres was more than praiseworthy.

The Great War in the Air

For days, even weeks, beforehand they had been venturing far out over the German lines. Day by day their reports proved more valuable and alarming. Dark swarming masses of German infantrymen were sweeping up over road, and rail, and field; new gun positions were springing up at every mile; supplies and reinforcements were being rushed up to the front lines, until the roads and railway lines were all hopelessly choked and congested. It was a pale-faced, scared observer who, on that dramatic day before Ypres, when it appeared that the endless enemy hordes must inevitably drive the painfully thin khaki line of "Contemptibles" back into the sea, brought in the report of having seen "the enemy reserves, great armies of them, swarming like locusts for miles around, to the north, and south, and east, seemingly never ending." To which the British C.-in-C. had issued his famous retort: "You must hold on, and, if necessary, do the impossible. I can lend you no assistance. The only reserves I have in Flanders at this moment are my own personal staff." How the few scattered remnants of the shattered British Army held, and ultimately drove off, an enemy force ten times its own strength is now a matter of history, as is also the part played by the airmen in that heroic defence.

Meanwhile, day in, day out, they saw the German masses, thousands of feet below, pressing on in numbers behind the mephitic vapours and foul dust that they raised from laid pipes and—in different but equally poisonous form—from bursting shell. But of the daring adventures of the R.F.C. pilots in those tragic days little can be recorded, so few of those gay adventurers ever came in again to make their reports. Such as there were, however, remained epics of the great war in the air. On Monday, May 7, 1915, the day upon which the naval airmen obtained such a striking success, two of their comrades in the Royal Flying Corps had a most adventurous flight. Whilst on reconnaissance about twenty miles from the British front they were attacked by several German planes. It was not long before the British pilot was shot through the jaw and neck. At first he collapsed and lost control of the aeroplane, but then recovered sufficiently to steady the machine, which continued its flight pursued and fired at by a succession of

The Cavalry of the Clouds

hostile aeroplanes. Nevertheless, he gradually grew weaker and weaker through loss of blood, and became hardly conscious of what he was doing, but the observer handed him bandages and helped him to bind up the wound, which was a dangerous one, while he kept the machine going, maintaining observation, and completed the reconnaissance. The pair of officers made a good landing at their base, having returned with the information which they had set out to get.

Air Fighting Increases

These encounters in the air were becoming daily more frequent. And though they were more in the nature of single-handed combats, the aviators being armed with nothing more than automatic pistols, and no definite theory of attack had yet been worked out, the losses in aircraft on both sides were already heavy. Already the Germans were working for the most part on their own side of the lines, and the dangers to reconnoitring British airmen increased enormously. In order to combat this the R.F.C. now sent up machines in pairs—one to reconnoitre, the other to fight. The fighting machines were usually of the faster, scout type, and were soon busily engaged. In the first two weeks of April British airmen accounted for five German machines. Between the 15th and the 19th four more were shot down; and in a thrilling fight at 6,000 feet an R.F.C. pilot drove off three enemy battleplanes. By the end of the month another three enemy craft had been added to the bag, one of which was chased down by a British machine to within rifle range of the trenches, and was then brought down by infantry rifle fire. And in a single week in May no fewer than thirty-five single combats between British and enemy airmen occurred over the German lines.

Unfortunately one of the most successful of our pilots was wounded in one of these aerial duels. Being alone on a single-seater monoplane he was not able to use a rifle, and whilst circling above a German two-seater in an endeavour to get within pistol-shot, was hit by the enemy. He managed to fly back over the British lines, and by great good luck descended close to a motor ambulance, which at once conveyed him to hospital.

The Great War in the Air

On the same day, farther afield, another British pilot had a thrilling experience. He was alone on a single-seater aeroplane, in pursuit of a German machine. While trying to reload his machine-gun he lost control of the steering gear, and the aeroplane turned upside down. The belt round his waist happened to be loose, and the jerk of the turn almost threw him out of the machine, but he saved himself by clutching hold of the rear centre strut, the belt slipping down round his legs. While he hung thus, head downwards, making desperate efforts to disengage his legs, the aeroplane fell from a height of 8,000 feet to about 2,500 feet, spinning round and round like a falling leaf. At last he managed to free his legs and reach the control lever with his feet. He then succeeded in righting the machine, which turned slowly over, completely "looping the loop," whereupon he slid back into his seat. This incident constituted a record, even in a service where hairbreadth escapes were of daily occurrence.

Some Thrilling Experiences

But even this lacks the vivid personal descriptive touch that flavours so strongly the following extract from the letter of an R.F.C. officer, describing his experience during those vital days in the air. "Last month," he wrote, "I certainly did have some very exciting experiences, and I will try and tell you something about them. One day, when troops were being moved up, we were sent out to patrol the lines and prevent German aeroplanes coming over. We met one coming over, and as soon as he saw us he turned and made for home in an almost straight line.

"The only reason he did not go in an absolutely straight line was that he wanted to lead us over the two anti-aircraft guns in this area. They shot at us, but they were afraid to aim in front, and their shells burst miles behind us.

"We chased him all the way back to his aerodrome, but, although we were a bit faster, we couldn't catch him, as he went down gradually, while we had to keep up. We saw another machine, but he went straight down too. We were so annoyed with these that we dropped two bombs, and then I fired about fifty rounds at them on the ground.

The Cavalry of the Clouds

"Another day, when there was a strong west wind blowing, I had a near shave of not being able to get home. We knew the wind was about as strong as we could manage, and we hovered about a long time before we settled to go over. We went over a little way once and got back fairly easy. Then we went about ten miles over and turned round to get home. For nearly a quarter of an hour we made no headway at all.

"Then the pilot put the nose of the machine down, and we came down to 3,000 feet and were able to make headway. But it would have been madness to go over the trenches at that height, making hardly any headway at all, so we climbed up again before we got to the trenches. Meanwhile, there was a big storm cloud which I could see coming up from the west, and it was an exciting race. If we got into the cloud we should have to come down or else lose our way hopelessly, and probably be blown back ten miles in half as many minutes. So I had to sit and watch the storm coming up, and keep looking to see if we were making any headway.

"When we were almost vertically over the trenches a bullet came through the bottom of the machine, through my puttee and leather coat, and out through the top plane. The next moment the clouds swept down on us. The pilot went straight down and we roared through the cloud. I hadn't the slightest idea whether we were going straight or turning round (you never can tell in a thick cloud), but when we emerged at about 800 feet we saw that we were comfortably this side of the trenches, and we got home safely. We had only ten minutes' petrol left, so we were lucky.

"It was a great success, as we were the only machine to get really over the lines that day. Next day we had to go over an area where we well knew there was a very good gun. We were particularly told to have a good look at this bit, so we had to go right over it. They soon began to shell us, and the concussion of the very first shot shook us and gave me quite a headache.

"They then got five or six very unpleasantly close shots at us, and a few feet below us, which fairly splattered us all over with bullets and splinters. One bit of shell passed between the pilot's legs, through the petrol tank, and just grazed past

The Great War in the Air

my shoulder. The petrol was spilt all over the place, and half suffocated the pilot. The engine stopped, and we sprang round to the right and down. We soon got out of range, and then the engine picked up. Luckily there was an auxiliary petrol tank, and we pointed for home as hard as we could go.

"Before we landed the pilot shouted to me to have a look over and see if the wheels were still there. A few days after this our engine stopped when we were right over Lille aerodrome, but it unaccountably started again. We could see the German machines on the ground below us."

How the Work is Done

Probably this flight was succeeded by a punitive bombing expedition on Lille. That was the natural order of things in the air. The fighting machine that clears the skies of enemy marauding craft makes way for the reconnaissance machine, which spies out the lie of the land, in its turn being superseded by the bomber, the destructive element, that to all intents and purposes is a super-long-range gun. Reconnaissance must precede destruction. The manner in which such an attack develops with a favouring wind cannot better be described than by the reports of progress brought in one morning by British aerial reconnaissances. It happened at a time when the enemy was making one of his earlier attacks with poisonous gas. An observer, who crossed the opposing front shortly after dawn, reported when he came back that a thick cloud of what looked like smoke outlined the whole of the German trenches. The next observing officer, who arrived some time afterwards, stated that to the west and south-west of the German line he could see a broad band of yellow grass and trees, which looked as if they had been bleached. A third, who came in later, stated that the whole area behind the British line was covered by a mist so thick as to interfere with observation. So the bombers were set to work. Rather more than half an hour later, following an ominous series of explosions in the enemy's back areas, there was an appreciable decrease in the amount of gas pouring over the British lines.

To hamper the enemy's movements and advance by de-

The Cavalry of the Clouds

stroying various points on his communications was the official description of the purpose of these bombing raids. And to consider this point at its fullest value a brief survey of the general field of operations is expedient. Roughly speaking, the great railway junctions at Menin, Courtrai, Don and Douai were the pivots of the whole German attack on the British and Allied front during the months of March and April, 1915. Fed by at least half a dozen main arteries from Ghent and Brussels, these particular junctions redistributed westward in a network of invaluable lines that, at an average of every ten miles, penetrated the German front lines. The strategic value to the enemy of these positions cannot be overestimated. And to this fact the British General Staff were fully alive.

Every available British aircraft was concentrated forthwith upon the Menin-Douai area. Most of these objectives were attacked at a height of only 100 to 150 feet. In one case the pilot descended to about 50 feet above the point he was attacking. There were only eight days during the period under review on which raids were not carried out on one or other of these points. And the most notable of these attempts were :

<i>Date</i>		<i>Objective</i>		<i>Results</i>
1915				
February 5	..	Lille aerodrome ..	..	10 bombs dropped.
March 11	..	Courtrai and Menin ..	..	Railway junctions destroyed.
.. 11	..	Don and Douai ..	..	Railway junctions destroyed.
.. 14	..	Don	..	Troop train blown up.
April 19	..	Ghent	..	Airship shed destroyed.
.. 24	..	Courtrai	..	Station bombed.
.. 24	..	Tourcoing, Staden, Roubaix, Langemarck, and Thielt.		
.. 26	..	Staden, Thielt, Courtrai, Roubaix, and Langemarck.		
May 2	..	St. Quentin ..	..	Ammunition depot destroyed.
.. 9	..	Standre	..	Railway junction destroyed.
.. 9	..	Fournes, Herlies, Illies, Marquilles, and La Bassée.		
June 19	..	La Bassée ..	..	Electric power station bombed.

The Great War in the Air

Very great damage was effected on all these positions, and the British airmen were untiring and undaunted in their efforts. One of our aviators, although wounded in the arm, continued on his course, bombed Courtrai station, destroying the junction, and brought his machine back safely to our lines. Somewhat later a British machine endeavoured to engage two hostile aeroplanes, which thereupon turned towards home. They descended to their own lines; but their pursuer, determined not to be baulked of his prey, though they had reached their aerodrome, threw two bombs on them, then fired fifty rounds at them and flew away. Another day a bombing expedition succeeded in finding its way through a dense mist, and coming down to within only 150 feet, in order to make sure of his mark, the pilot dropped a bomb on the important railway bridge at Menin, destroying one of the piers. Another, flying over Courtrai railway junction, dropped a bomb on the station and completely wrecked it. These were both points of vital importance on the German communications.

A Joke from the Air

The 1st of April was not allowed to pass without at least one practical joke being played on the enemy by the bombing squadrons. A British airman, flying over Lille aerodrome, dropped a football. It fell slowly through the air, and the Germans could be seen hurrying from all directions to take cover from what they evidently thought was a bomb. That it bounced to an enormous height from the ground without exploding was probably taken to be due to a "delay action" fuse, for it was not till the ball finally came to rest that they emerged from their shelters to examine it. On the ball was written: "April fool! Gott strafe England."

An affair of altogether another nature was a meeting between a British aeroplane squadron and a German airship, both bound on bombing expeditions, which encountered and as rapidly lost one another in the dark hour before the dawn. The airship appeared in the sky to the east of the British line and dropped four red stars, which floated downwards slowly for some distance before they died out. When our men, whose eyes had not unnaturally been fixed on this display of pyro-

The Cavalry of the Clouds

technics, again turned to their front, it was to find the German trenches rendered invisible by a wall of greenish-yellow vapour, which was bearing down on them in the breeze.

"Balloon Strafing"

The chief aerial event of interest which occurred elsewhere on the British front at this period was the aerial raid made on April 19 against the German airship shed near Ghent. It was carried out by an officer single-handed. Carrying three heavy bombs, besides hand grenades, he arrived near his objective about 5 P.M., and found that a captive balloon was anchored on guard. It was a calm evening, which enabled him to manœuvre, and as he was reconnoitring the position he threw one bomb at the airship shed, clearly visible below, from a height of some 6,000 feet. Then, on discovering that he was being fired at from the car of the balloon as well as from the ground, he flew over the balloon, and, descending in a spiral directly above it, so that its occupants could not shoot at him, he threw his second bomb at it. This missed its target, but exploded below, probably doing a certain amount of damage, as by this time the whole neighbourhood of the aerodrome was alive with soldiers running about and shooting.

Still planing down steeply as directly under the balloon as possible, so that its occupants could not conveniently shoot downwards, and the troops below could not shoot upwards for fear of hitting their friends in the car, and continuing to throw hand grenades at the enemy balloon until he was below it, he descended to a height of some 200 feet before he dropped his last bomb on the airship shed below. He then flew back to his base untouched, though the planes of his machine were perforated with bullet holes.

Thus ended a period of aerial activity of which Sir John French officially reported that : "The work of the Royal Flying Corps throughout this period, and especially during the operations of the 10th, 11th and 12th March, was of the greatest value. Though the weather on March 10 and on the subsequent days was very unfavourable for aerial work, on account of low-lying clouds and mists, a remarkable number of hours' flying of a most valuable character was effected, and continuous

The Great War in the Air

and close reconnaissance was maintained over the enemy's front. Certain new and important forms of activity, which it is undesirable to specify, have been initiated and pushed forward with much vigour and success. No great activity has been shown over our troops on the part of the enemy's aircraft. A total of approximately 130,000 miles have been flown, almost entirely over the enemy's lines."

CHAPTER X

LIGHTER-THAN-AIR CRAFT

The Inglorious Earlier History of the British Airship—"Beta," "Gamma," "Delta," "Eta"—Brigadier-General Maitland—Training the British Airship Personnel—The Aeronaut in War—Early French Airship Raids—Italian Semi-Rigids—Kite Balloons in Action—Kite Balloons at the Second Battle of Ypres, 1915—The Captive Balloon and the Fleet.

A COSTLY experimental toy that developed to a certain degree of efficiency through the zealous efforts of enthusiasts, whose good intent was wholly nullified by the misguided efforts of amateur and unskilled constructors, abandoned in despair for many months, reconsidered in a spirit of good-natured contempt, hastily and thankfully turned over by the Army to the Navy late in 1913, overlooked in the first mad rush of war, gradually but surely forcing its way to the front, and, as a first-class aircraft of war, finally eclipsing all others—such is the tabloid history of the airship in British aviation. It is an inglorious early record.

So far-seeing an enthusiast as Mr. Winston Churchill, as late as 1915, frankly avowed himself party to the general contempt of the "gas-bag." America yet possesses no airship of any consideration. In Britain it was the fashion for the majority, the heavier-than-air enthusiasts, to deride and hamper the development of the airship and her sister craft to the top of their bent. Even to-day most aeroplane pilots secretly cherish a certain contempt for the lighter-than-air craft. And that attitude has coloured the official bearing towards the development of the airship throughout. Little wonder, then, that Britain went to war with a fleet that consisted of two airworthy ships!

If the development of the airship is an inglorious record,

The Great War in the Air

the history of that development is one long, unbroken toll of inefficiency, apathy, muddle and disaster. As a nation, frankly, we appeared not to want the airship. Perhaps the mere fact of Germany concentrating all her efforts on her giant Zeppelins aroused that perverseness of our insular nature and drove us headlong into an extensive aerodynamic construction. Be that as it may, the fact remains that never officially, and in but few public instances, was support, either financial or moral, vouchsafed the airship in Great Britain.

As long since as 1900, however, Dr. Barton made his first partially controlled airship flight from Alexandra Palace over London. In 1907 the Government balloon factory at Farnborough, under the joint direction of Mr. F. S. Cody and General Capper, R.E., carried out experiments with dirigibles. The first ship, for all the world resembling an unwieldy inflated sausage, early came to grief in a sudden rain squall. More than likely it was its unfortunate choice of appellation, the "Nulli Secundus," that courted this disaster; but it must be admitted that, before this ignominious climax, the "Nulli Secundus," in a trial flight that circled the dome of St. Paul's Cathedral, established a world's duration record of three hours and twenty-five minutes.

It was a somewhat unfortunate choice, then, that the second craft of this type should be facetiously christened the "Nulli Secundus II." For during a flight from Farnborough to Crystal Palace, October, 1907, the airship encountered a storm of wind, and, in making a precarious landing, was most successfully wrecked. And this sad chapter of accidents was to continue over several years' further experimentation. Officially termed "Dirigible II," the next craft, a "baby" airship, with a long fish-shaped envelope, was inspected by the King in the early part of 1909, and, though somewhat limited in her flying powers, was considered satisfactory enough to warrant a second edition. In due course, twelve months later, the "Yellow Peril"—so styled by reason of the violent yellow dope that covered its outer fabric—made its appearance. On general lines it was constructed after the fashion of the French Clément-Bayard, a long stream-lined envelope with a nacelle suspended underneath. Though fairly successful in its trial

Lighter-than-Air Craft

flights, it was afterwards scrapped as failing to attain the standard requisite for war purposes.

In 1910, still undaunted by these numerous set-backs, the balloon factory essayed a new type of dirigible. This was a craft of the non-rigid type, with the envelope and nacelle in two separate portions, that was fitted with stern ballonets in place of the original fins. The first ship of this new series was the "Beta." After two quite successful return voyages from Farnborough to London, the "Beta" participated in the autumn manœuvres of October, 1910, covered over 3,000 miles in the air in her brief career, and afterwards rendered invaluable service by escorting the troopships of the British Expeditionary Force across the English Channel during the first month of the war. She was succeeded by three slightly larger ships, the "Gamma," "Delta," and "Eta" respectively.

The Willows Airship

Meanwhile, civilian enterprise had been making strenuous efforts to perfect the British dirigible. Foremost among these unthanked pioneers was Mr. Willows, of Cardiff. Despite every possible deterrent put in his way on the part of the authorities between 1904 and 1910, Mr. Willows constructed some half a dozen different types of airships. After several preliminary local flights, in 1909 he flew from Cardiff to London, a distance of 140 miles, in a trifle under ten hours. This ship was 74 feet in length, 18 feet in diameter, and was fitted with a 7-h.p. Peugeot motor; and he navigated it through the air by the somewhat unique procedure of descending towards the earth at every few miles and inquiring his whereabouts of passers-by by means of a large and powerful megaphone. Already, in 1908, two of his craft had been purchased by the balloon factory; and in November, 1910, he essayed a further flight from Wormwood Scrubbs to Paris. With a single passenger he reached the French coast without adventure. But it was then 2 o'clock in the morning. Unable to discern the landing-place in the inky darkness, the airship was seriously damaged in landing. She was immediately taken to the neighbouring Clément-Bayard works, but it was not until several further attempts that the daring aeronauts eventually reached Paris.

The Great War in the Air

By this time, however, public interest in the cause of the airship in Britain had been aroused. A public subscription, organised by the *Morning Post*, was employed for the purchase of a French craft, a large Lebaudy airship. This craft, after extensive tests at Moisson, was flown across to Aldershot, the flight of 197 miles being accomplished in 5 hours 28 minutes. Again, unfortunately, the craft was damaged when landing, and required several months for repairs. Her end was as tragic as usually appeared to overtake all British airships in these days. Taking advantage of a fine summer afternoon, her pilot took her out for a short flight round Farnborough. After about half an hour a sudden wind sprang up, and he hurriedly turned her for the shed. A large party of mechanics had been detailed to await her arrival, and were already on the field when she came in sight. But either she did not descend to a low enough altitude, or they had misjudged her landing, for they failed to grasp her trail ropes, and she swept on far from the ground again unchecked. A second and a third attempt proved no more successful. Then the wind caught the airship broadside on, and hurling her against some neighbouring trees, she was damaged too greatly to permit of further repair.

The Vickers Rigid Airship

After this unhappy event little further was accomplished before the outbreak of hostilities. The Admiralty, which had already taken over all lighter-than-air craft from the War Office, now appeared to take some interest in aerostatics. Vickers were ordered to construct a large rigid craft, somewhat after the type of the enemy Zeppelin, and after twelve months of unremitting labour it was announced that this craft was ready to take the air. Unofficially termed the "Mayfly"—an unhappy sobriquet—she was taken over by the naval authorities without any preliminary test, with the result that on the first flight in the air the craft was wrecked, and her crew only escaped with their lives by diving beneath her huge carcass as she lay helplessly on the surface of the sea. However, during 1914 further purchases were made of a Parseval from Germany and an Astra-Torres from France.

Lighter-than-Air Craft

Under this new fierce impetus the capabilities of airships improved remarkably.

First came the original "Blimp," the sea-scout non-rigid airship of 60,000 cubic feet gas capacity, developing into the S.S. Zero of 70,000 cubic feet, and culminating in the 100,000 cubic feet G.S. Twin, which, with her two engines, attained a speed of 60-65 miles an hour.

In the next class of air cruiser, the "Coastal," with a volume of 170,000 cubic feet, was evolved from the Astra-Torres type of airship, and later this type was enlarged and refined in the C. Star of 200,000 cubic feet.

Following the Astra-Torres principle also, the airship designers of the Royal Air Force developed the wonderful "North Sea" class, of 480,000 cubic feet capacity and 500 horse-power, undoubtedly the finest and most airworthy non-rigid airship in existence.

The Development of British War Airships

In rigid airship design it must be confessed that our knowledge was due almost entirely to the late Count von Zeppelin, who in 1900 launched his first airship, a mammoth at that time, having a capacity of 400,000 cubic feet.

During the war the enormous value of the rigid airship as a scout to the Fleet rendered the development of these long-range aircraft a matter of vital necessity to Great Britain.

Despite the difficulties involved by lack of experience, enormous strides were made. As a first step a succession of training airships were made of slightly varying types, each with a gas volume of about 1,000,000 cubic feet.

Then came the more ambitious class of 1,500,000 cubic feet, followed by a larger model still, of approximately 2,000,000 cubic feet capacity, a type that would be capable of making the return flight to America without descent.

The progressive growth of the airship in size and capabilities is a matter of years rather than of months. When one reads of airships having a capacity of ten million cubic feet, it must be understood that the great advance from the present size to this future leviathan of the air can only be made as the result of successive experimental steps. And, in the same way, it

The Great War in the Air

illustrates beyond all doubt the advance made with airships since 1914.

The great development in British airships may be claimed solely to the unstinted effort of one man, Brigadier-General E. M. Maitland, D.S.O. At his own wish, and then but a captain in the Essex Regiment, in fact, almost as part of the transfer of the craft, the General went over from the Army to the Royal Naval Air Service. Officially termed, he had been loaned to the Admiralty for five years. But even then he knew he would never return to the Army again. He was one of those wise ones who had foreseen the near advent of the Great War, and, what was more, was anticipating the day when the Royal Air Force was to become a separate Service. As a proof of the great interest and belief he had in all lighter-than-air craft, it may be stated, at the outbreak of war, Captain Maitland had already qualified for his aviator's, airship and aeronaut's certificates alike—a record. And no man was better qualified than he to superintend the great Service already in the making.

General Maitland's Work

How he made good with his "gas-bags" is a story of constant endeavour in face of the most uncalled-for ridicule on all hands. His contemporaries at the Admiralty would smile knowingly at "Maitland's fad," as they were pleased to call it. But the Colonel—he had been awarded a well deserved promotion in the meanwhile—always got what he wanted, though many vital months were lost in the getting of it. After an extensive tour of the Belgian observation balloon service in the autumn of 1914, he immediately sent in an urgent recommendation to the Lords Commissioners. And at last, after bringing great social influence to bear, the Admiralty gave him permission to experiment with kite balloons, which, after all, was but the thin end of the wedge to the great airship service, the scheme of which was already well formulated in his mind to the smallest detail.

A score or so of midshipmen—all volunteers—were seconded from the Grand Fleet to Roehampton naval air station for balloon work, and to Wormwood Scrubs for airship work.

Lighter-than-Air Craft

Small subsidiary air stations were established at Polegate, Capel (near Dover), and the Isle of Grain. The craft selected for training were the "Blimp" airship and the "Parseval-Sigsfeld" captive balloon, particulars of which are given later in the chapter. The training of these young men was extemporised to meet the needs of the new service.

This training followed automatically the evolution of the airship itself. After a preliminary course with free balloons, the pupil proceeded to either kite-balloon or airship. But both were pretty similar in general properties. Here the science of aerostatics became an important factor.

Generally speaking, one may say that aerostatics deal with all aircraft lighter than air. The balloon floats in the air like a fish in the sea, because the buoyancy of its bulk displaces the same weight of atmosphere as the craft weighs as a whole. The whole principle of aerostatics is governed by the ancient law of Archimedes, that "Every body which is immersed in a fluid is acted upon by an upward force exactly equal to the weight of the fluid which is displaced by the immersed body." In more simple language, the principle of the lighter-than-air craft is that the more the gas in the envelope expands the higher the balloon rises; inversely, the less gas the less altitude. And, as has already been stated, the development of the airship occurred in three stages—the old-fashioned spherical balloon, then the captive, also spherical, and finally the dirigible. It is in this order that the airship pilot learns his craft.

Before handling an airship he must qualify in the following tests in a free balloon :

(a) A record of twelve ordinary ascents, an ordinary ascent being an ascent made as a passenger in a free balloon.

(b) A record of a night ascent, which must not be made until at least ten ordinary ascents have been completed.

(c) Two certificates of observed ascents, the aeronaut taking entire charge of the balloon throughout the run from start to final descent, and not being advised in any way as to the management of the balloon.

Then, these flights being completed, the airship pilot must needs commence all over again and qualify for his airship

The Great War in the Air

ticket, the conditions for which are twenty-five ascents in an airship on different dates.

(1) On five of the airship ascents the pupil must pilot the airship during the whole of the flight, with a certified pilot on board, who must report on the pupil's efficiency.

(2) During the five ascents the airship must have

(a) Attained a height of 2,000 feet on at least one occasion ;

(b) Accomplished a flight of at least two hours' duration on at least one occasion ;

(c) Been taken out of its shed or other shelter and replaced after flight under the command of the pupil on at least one occasion.

(3) The pupil must be able

(a) To answer simple questions on map reading ;

(b) To lay off a course on a map or chart, and give compass bearings with the necessary allowance for wind ;

(c) To explain principles of forecasting weather ;

(d) To explain rules regulating the navigation of aircraft.

Thus it will be seen that the airship pilot's post is no sinecure. And, even now that the wonderful story of the development of British airships has been disclosed, it is scarcely realised how great a debt the Allied peoples owe to the airship crews of the British Royal Air Force.

Richly deserved eulogies have been showered on the fighting pilots of the aeroplane squadrons, and on the observers and aerial gunners, who in France and in all theatres of war gained and maintained the ascendancy of the air for Britain. But the part played by the pilots and crews of airships has passed almost without recognition. Because their duties have been less spectacular their work is scarcely known to the world at large.

Airships and the Navy

The crews of the airships, imbued with every tradition of the "Silent Service," with which their work has been closely associated, can rarely be induced to talk of their experiences. The duties which they performed were often of a negative nature, an incessant watch over the same area of sea, and but few encounters with the enemy to relieve the monotony.

Lighter-than-Air Craft

Month after month, in the brilliancy of summer, when in the early morning the sea has been aglow with scintillating light, and in the bitterness of winter, with its fogs and driving snow, the airships have gone out to sea to maintain this watch—and some have not returned.

The airship stations were generally situated far away from the great towns, so that few people were aware of the large share taken by airships in assuring the British, and, for that matter, the Allies', food supply. The crowds of visitors at seaside resorts in summer time, who sometimes saw airships cruising pleasantly over the sea in the course of routine patrols, did not see these same ships going out into the Atlantic or the North Sea, plunging through driving rain or snow to meet and escort the vessels on whose safe arrival the life of the nation depended.

The Coastal Patrol

For three and a half years a constant patrol was kept with every airship able to fly. It was of small account at the commencement, when few airships were available; but it gradually attained greater importance as the number of ships was augmented until, at the close of hostilities, practically every shipping route around Great Britain was under the surveillance of airships.

It was as an anti-submarine craft that the British airship first came into prominence. Simultaneously with the date of the commencement of the German U boat campaign developed the airship service that very soon was to become the largest and the finest in the world. Unfailing protection was rendered to convoys, encroaching enemy submarines were harried and either driven away or destroyed, and great numbers of mines were located and exploded by Lewis gun fire or turned over to surface craft for destruction.

As a result of the unceasing efforts of the airship pilots and crews of the Royal Air Force, in collaboration with their comrades of the hustling flotillas and mine-sweepers, the activity of submarines in the vital areas in the vicinity of ports was checked to such an extent that the German plan of starving Great Britain was brought to naught.

The Great War in the Air

It should not lightly be forgotten that during the whole period of the war not one sea vessel was lost whilst under the escort of a British airship.

At the period of action, however, the airship was still in an indeterminate stage as a vessel of war. Apart from the work of the German Zeppelins, only two airships—both French craft—had been in action. Both sorties were in the nature of bombing raids. In the first the airship had been ordered to make its way to a certain locality in the enemy's country and to blow up a railway junction. It rose to an altitude of about 5,000 feet, and, showing no lights, set out towards its destination. In the darkness it managed to avoid the German searchlights and discovered the point it was ordered to attack. It descended a little in order that it might be sure of its aim, and let three bombs fall. Fire was opened upon it, and hastily it started to rise.

At full length on the floor of the car two officers watched the effects produced by their bombardment. The captain, aided by a mechanic, had just placed a fourth bomb in position. Suddenly the mechanic exclaimed: "The bomb has stuck." It had wedged itself firmly in the tube, and it was only a matter of seconds before it would explode. The captain did not lose his presence of mind. He snatched up a hatchet, and with four vigorous blows cut away the whole bomb-tube just in time. The bomb exploded a few hundred feet below the car, and the airship was able to return uninjured to its shed.

The second French airship raid, November 14, 1914, proved of immense value to the General Staff, cutting off the enemy's supplies of ammunition in that district for over a fortnight. The Germans had accumulated at Tergnier, north of Soissons one of the most important strategic points on the Northern Railway system, a large number of locomotives and wagons for use in the transport of their stores. Then one night, about 1 A.M., a French dirigible flew over the station, halted, descended to a low altitude, and dropped on the engine shed several bombs, which destroyed the greater part of this material. Other bombs blew up the permanent way, and others destroyed the viaduct connecting Tergnier with the railway lines leading eastwards.

Lighter-than-Air Craft

French Airships

The French had already made considerable progress with their airships. As the pioneer ballooning country of the world they held a very great advantage from the start. The Lebaudy brothers led the way. In 1899 they constructed the "Jaune," a vessel 183 feet long, 30 feet in diameter, and of 80,000 cubic feet capacity. The engine was a 40-h.p. Daimler, and gave a speed of 26 m.p.h. In 1902 she made twenty-nine flights, and was successful upon twenty-eight of these occasions in returning to her starting-point. In November of that year she hit a tree when landing and became a total wreck.

In 1904 the Lebaudys produced their next craft, the "Lebaudy." This vessel was possessed of a triple airbag or ballonnet, was 190 feet long, and had a capacity of 94,000 cubic feet. She was a most successful ship, and after seventy-six flights had been made their "rights" were acquired by the French Government, who therewith commenced to construct Lebaudys at Moisson. They were of the semi-rigid type, with a spar running along the entire length of the envelope, thus evenly distributing the weight.

In 1906 there followed by the same firm the "Patrie," and in 1909 the "République." They were larger and improved types of the "Lebaudy" ship, with an average speed of 28 m.p.h., a radius of 280 miles, and accommodation for a crew of nine. In 1907, while the "Patrie" was anchored outside Verdun, she was torn from her moorings in a violent gale, and trailed off over Northern France and the British Isles, and finally disappeared in the direction of the Atlantic Ocean.

The "République," which was fitted up with an engine of some 80 h.p., made successful flights over a period extending from July, 1908, to September, 1909. Then, a propeller breaking in mid-air, a blade flew upwards, tore a large gash in the envelope, and killed two officers and two N.C.O.s. Similar airships of the same type were the "Russie" and "La Liberté."

The first craft of the "Clément-Bayard" type was the "Ville de Paris." In length it was 200 feet, fitted with a 70-h.p. motor, giving a speed of 25 m.p.h., and having a capacity of 120,487 feet. In 1909 came the "Clément-Bayard," a larger ship, but

The Great War in the Air

built on similar lines. Her engine was 100 h.p., and gave a speed of 30 m.p.h. On August 23, 1909, the "Clément-Bayard" flew for two hours at an altitude of 5,000 feet, but finished her career by depositing herself in the Seine. Other ships of this class were :

The "Ville de Bordeaux"	...	3,200	cubic metres.
The "Ville de Nancy"	...	3,200	" "
The "Colonel Renard"	...	4,000	" "
The "España"	...	4,000	" "
The "Clément-Bayard II."	...	6,500	" "
The "Trans-Aerienne I."	...	6,500	" "
The "Flandre"	...	6,500	" "

Several of these later craft were Astra-Torres, designed by a Spanish engineer, Senor Torres.

Italian Airships

It has been said by many aeronautical experts that the Italian semi-rigids were the finest in the world. The first P₁—P, "Piccolo," a small size—was constructed in 1908. The P₁ was 200 feet long, of 40 feet diameter, had a motor of 100 h.p., and possessed a speed of 35 m.p.h. She was not very successful in her trials, and in 1912 the Government purchased a Parseval from Germany.

The next home-constructed product was the M class—M, medium size—with engines of 500 h.p. and a speed of 48 m.p.h. She was 250 feet long and 55 feet in diameter, the largest semi-rigid ever constructed.

The next class, but of the same type, was the Forlanni, and the "Citta di Ferrara" was the finest ship of the class. She had a capacity of 424,000 cubic feet, a length of 233 feet, a diameter of 59 feet, and three 85-100 Isotta-Fraschini engines.

The Italian airships accomplished many useful flights during the war.

It has already been stated that reference was to be made to the Parseval-Sigsfeld kite-balloon. The important part this queer ungainly craft was to play in the war may best be judged by the fact that within twelve months of their first appearance on the Western Front, a kite-balloon was to be found in opera-

Lighter-than-Air Craft

tion to every five miles of the British lines. As a matter of fact, it was the Germans who first introduced the captive balloon into the Great War, and were employing them before Ypres as early as the autumn of 1914.

Kite-Balloons in Action

It was at this time that the kite-balloon first earned its nickname of "sausage" from the British Tommy. For that matter he coined a new word for everything however remotely connected with the air. The German anti-aircraft shell, which puckered the sky with its burst like snowballs round every British aeroplane that crossed the lines, was soon known to the inventive infantryman as "Archibald." And no aeroplane now came to earth after a flight without the pilot being asked if he had met "Archibald" on his journey. He was irritating company, who, unlike his shrapnel predecessor, burst upwards. The new vocabulary of the R.F.C. was already becoming unlimited.

However, to return to the Parseval-Sigsfeld. This balloon combined the qualities of the ordinary spherical captive balloon with those of the man-lifting kite. But where the latter depended for its sustenance in the air on relative wind currents, the former was able to ascend even in a dead calm. And, on the other hand, when the wind was high, this new kite-balloon, unlike its predecessor, the spherical, did not rotate and oscillate dangerously when in mid-air.

Kite-balloons were employed in the war both ashore and afloat, and the spheres of action were radically dissimilar. The first of the Kite-Balloon Section, under Major the Hon. Claude Brabazon, participated in the second battle of Ypres, but was under the direction of the Royal Naval Air Service, which was making use of these queer craft over twelve months before the R.F.C. took them in hand.

This first section was to prove invaluable in co-operation with the British artillery, which was staving off the herculean efforts of the enemy to capture Ypres. And barely a man moved within five miles of the enemy lines, or an ammunition lorry came lumbering along a side road leading toward the firing line, but a pair of keen eyes steadily watching from the

The Great War in the Air

sky behind the British lines took notice of it. Every movement, every German activity was registered until a schedule of the usual enemy routine—complete and accurate as a railway timetable—was built up and the average amount of motion known. Any departure from this schedule was suspected. A train running late or with more coaches than usual, men in the trenches being relieved too often, new roads or gun emplacements being run up too earnestly gave the first hint that the enemy, over there, was developing some new form of attack. But those sharp-eyed observers of the kite-balloons missed no single detail however insignificant. "To blind, but not to be blind too," was the motto of the Kite-Balloon Section, R.A.F.

The balloonist, riding steadily for hours at a time with the German lines spread out before him, and in direct telephonic communication with the ground, with his batteries and other balloons—a system of working was evolved by which the kite-balloons worked in duplicate and in triplicate upon the same objective—gathered a mass of details and accurate knowledge which his colleague of the aeroplane could not hope to secure. Hours passed, perhaps, but finally, as inevitable as fate, the reward came. A single flash, a slight movement across the line, and another tiny claw of the German eagle revealed itself for the Allied artillerymen beneath.

A keen observer noted any of these changes, and at once telephoned down to the ground, "An extra train of six coaches passed at 10.40." Half a mile farther down the line another pair of eyes reported, "Numerous enemy reinforcements moving up to the front, range so-and-so." Still a little farther down another suspicious circumstance was noted, until the General Staff down below, assembling all these straws, foresaw the beginning of a big offensive across the lines. Counter measures were taken, batteries directed, convoys and trenches smashed up, and the enemy's plans thrown hopelessly askew. The work of the captive balloonist developed into a fine art.

The balloon employed was the same both ashore and afloat. The two main portions of the craft were the envelope and the car. The former was the balloon portion which was filled with gas and provided the necessary lifting power. The latter, strung below the envelope by means of the rigging, was a large

Lighter-than-Air Craft

basket capable of housing a crew of two, with maps and other necessary paraphernalia. The main idea of the craft was that it set itself diagonally like a kite to the direction of the breeze. It was serviceable in a wind of up to a velocity of forty miles an hour.

The only remaining portion of the craft was the steering bag, a strange excrescence under the hinder lower parts. The function of this bag was to keep the balloon head on to the wind. The air entered the steering bag and passed by means of another valve into the air-bag whenever the pressure in the latter fell below the normal. Thus the air-bag was constantly kept tight and so solidified the whole balloon.

To hold it in captivity the balloon was connected by a light and durable steel cable to a steam winch on the ground below. This cable was originally attached to only one part of the rigging. With the later kite-balloons, however, it was found more expedient to connect it at two different points, thus always holding the craft at an angle of between thirty and forty degrees to the horizontal.

Behind and below the main body there hung a long ungainly tail of six small parachutes. The purpose of this tail was to anchor the craft against any sudden gust of wind, which would be extremely dangerous to the observers in the basket and liable to tilt them out.

Kite-Balloons in the Navy

Perhaps one of the most interesting duties of a kite-balloon officer in the Royal Air Force was that of spotting at sea for naval guns.

The chief use of the kite-balloon in conjunction with naval guns was the same in principle as with land artillery, namely, the direction of fire on to targets which were invisible from the firing ship.

The balloon may or may not have been carried by the ship. For a naval bombardment of land objectives it was not essential that the balloon was attached to the ship. But there were two types of kite-balloon ship in use, the chief difference between them being that, in one case the balloon was carried on the upper deck, and, in the other, in a well cut out for the purpose.

The Great War in the Air

The second method appears on the whole to have been preferable, but while it had the advantage of affording protection to the balloon, it had the disadvantage that the cutting out of the balloon hold weakened the ship. Neither type of balloon carrier was necessarily mounted with heavy guns.

The balloons, then, were observation stations in the air, with a longer range of visibility than the ships below, and the function of the observers was to direct the gunfire on targets invisible to the gunners. The simplest target was, of course, one which was stationary and prearranged. In this case the observer studied the map carefully and determined the bearing of the target from the spotting position as well as the bearing of some prominent feature in the proximity of the target. He was expert in the judgment of distances and of contours, and was obliged to know the height his balloon must reach to enable him to see into the bottom of a valley—otherwise he was unable to locate the burst of a shell and his spotting corrections would become valueless.

The target which was not prearranged was indicated by the observer to the gunners by means of a "squared map," and preliminary study of the map was even more important than in the case of the prearranged target, because in order to indicate accurately the square in which the target was situated, a precise knowledge of the relation of the surrounding prominent features was necessary.

A moving target was signalled by bearing and distance, and its direction and pace had also to be judged and stated.

Corrections were given either by taking the line of fire (firing ship target) as the basis, or by the "clock face" method, the target being the centre, and the approximate error of each shot being indicated by reference to the hours of the clock.

It has often been said that airmen were the eyes of the Navy and Army. This slight sketch of the duties of an R.A.F. kite-balloon observer at sea shows how literally true that description is of the whole Royal Air Force.

CHAPTER XI

THE FRANCO-GERMAN WAR IN THE AIR (FRANCE)

French Campaign of Reprisals—The German Message from the Skies—Superiority of the French Aviators—The Glorious Death of Senator Reymond—Garros and Pegoud—Organisation of French Aviation Corps—Northern and Southern Spheres of French Aerial Activity—La "Ville Lumière"—The Manner in which a May Aeroplane Raid on Paris was Frustrated—The Death of Lieutenant von Bülow of the Berlin Imperial Guard.

UNDOUBTEDLY the most important phase of the summer's war in the air in France was the reprisal campaign on the Grand Duchy of Baden, that took place in June, 1915. In letter, the enemy, by bombing presumed unmilitary cities and "open" towns, killing numerous women, children and helpless civilians, and causing an enormous amount of damage to private property, had violated every rule of civilised warfare. In spirit, however, the scientifically developed modern monster of war had outgrown the antique garments of the Hague Convention. The war was yet young, however. Paris, Dunkirk, Nancy, Calais, Margate, Chatham and London had all suffered untold horrors at the hands of the raiding German airmen, when, on June 4, the French authorities announced that: "As a reprisal for the bombardment by the Germans of open towns in France and Britain, orders were given to bombard this morning the capital of the Grand Duchy of Baden."

The raid is interesting from the point of view that it was the first attempt of concerted squadrons of aeroplanes in the war of any size. Twenty-three French machines, fighting their way desperately through an intense bombardment at Zabern, Strasburg and Rastatt, *en route*, and losing two of their number on their return journey at Pfalzburg, appeared over Karlsruhe at five o'clock in the morning.

Instantly the town was in a state of mad panic. The rail-

The Great War in the Air

way lines were chock-a-block with troop trains at the time, and desperate efforts were made to get them out of the station before the French aviators got to work. However, the attempt proved useless, for one of these trains was hit by a bomb, almost direct, and the smoke and flame of its burning could still be seen reflected against the eastern sky when the French airmen were fifty miles on their homeward way. Altogether 130 bombs of 90 and 155 millimetres diameter were dropped on to the town, and many fires were seen to break out while the aeroplanes were still hovering overhead.

This attempt had been preceded the day previous by a not unuseful raid by twenty-nine French aviators on the headquarters of the Crown Prince, who, unfortunately, was not at home at the time of the visit. They dropped 178 bombs, many of which struck their objective, and also several thousand darts. All the aircraft were heavily shelled, but all returned safely. And the same day—June 4—about 7 A.M. five or six French machines appeared over Ludwigshaven, the noise of their engines again sending the inhabitants into a state of abject panic. The weather was calm and clear. When the machines appeared anti-aircraft guns and machine-guns opened a vigorous fire. The airmen circled over the town and the Rhine for about twenty-five minutes, and then flew off westward seeking other promising targets.

A great number of bombs were dropped, one of which fell in a house in the Friesenheimerstrasse, killing three persons and seriously wounding five. A second bomb exploded in the Maudacherstrasse, again killing three and wounding four persons.

Two of the French airmen were shot down, and another was compelled to descend near Griesheim owing to engine failure. The occupants burned their machine and were taken prisoners by the German troops. A great number of bombs were dropped on the aniline and soda factory, five persons being killed and fifteen wounded. The total results of the raid were twofold. On the one hand, the German High Command, bothered incessantly by the complaints of the inhabitants of the towns attacked, decided to suspend air raids, at least for a few months, on French towns. On the other hand, their battle pilots

Franco-German War in the Air (France)

developed a very wholesome respect for the prowess of the French airmen.

Through all the vague, unconsidered controversy that marked aerial warfare on the Western Front at this time, and despite the bluff of the enemy official statements as to the undoubted superiority of their aviators, events go to prove beyond all doubt that Latin brilliance and daring had gained a marked superiority in the air to German method and organisation but woeful lack of imagination.

During the first six months of the war on two distinct occasions the work of the Frenchmen proved, in the districts affected, that the enemy had been driven off from the air over his firing lines. What is more remarkable still is that it was a reconnaissance flight in both instances, and both occurred during the crucial moment of an important battle! It was an aeroplane, battling its way through a driving snowstorm, that brought the first news to French headquarters of the great German retreat to Saint Croix, one of the turning points of the war. In vain the Germans attempted to re-establish themselves in their original positions. Three hours before the great advance was timed to start off an inquisitive French pilot signalled the arrival of German reinforcements by rail from Laon. The aeroplane received orders to bombard the trains, but, after dropping several bombs, the machine and pilot were hit and compelled to descend to the north of Sainte Marguerite, between the two lines. French troops succeeded in rescuing the wounded pilot by a bayonet charge. With their quick natural perception they realised that this Heaven-sent emissary from the skies was the casual aviator who had saved a French army corps from destruction.

French Aviators are Better than German

This marked superiority of the French is repeatedly evinced, both in the desperately fought summer campaign in the air, and through the months of desultory fighting that had preceded it. The German, for the time being, at least, played a very second fiddle in aviation. Despite the atrocious weather and constant improvement in the German anti-aircraft fire, the French all the time showed considerable activity. At the

The Great War in the Air

Christmastide the German celebrations were helped on from the air in a manner that must have proved unusually acceptable to their blood-and-iron ideals.

On Christmas Day twelve large bombs were dropped on a German infantry company that was resting in billets behind Gercourt, four on a bivouac at Dondrien, and 2,000 darts on wagons and infantry at Nampeel. Another raid, a punitive reply to the recent Zeppelin attempt on Nancy, dropped bombs on Metz railway station, and in the period from December 26 to 31, further visits were paid to the railway stations at Château Salions, Remilly, Arnaville, Thiaucourt, and Heuvricourt. On the 26th ten bombs and 3,000 darts—*flechettes*—were dropped on concentrations, troops and bivouacs, both by night and by day—the first development of aerial night work that was later to assume such extensive proportions. On the 27th eight bombs were dropped on an enemy captive balloon on the heights of the Meuse, and on the 29th 2,000 darts were showered on a detachment at Dondrien. For some considerable time afterwards German aviators gave the French territory a wide berth in their wanderings. They even seemed to develop some sort of apologetic admiration of their opponents' daring. For, on December 31, a German airman, circling very low over Dunkirk and making signs that he was bound on no warlike mission, dropped a note, in which he stated that he wished to inform their relatives of the fate of two French airmen who had been brought down by the Germans the previous day. With this he enclosed a note from the aviators themselves, which ran :

A Thrilling Letter

"We met with a bad accident yesterday, but we are still alive. Our motor was working splendidly when we passed over the lines at Ypres. Then we were subjected to a violent cannonade between Menin and Courtrai. At a height of 2,400 metres the motor began to misfire. We tried to get back, but still the engine would not work. We could see Ypres, but our machine continued to fall, and with rage in our hearts we were obliged to land. During our descent the guns continued to fire, and the aeroplane was tossed about by the air waves caused by the bursting of the shells. The infantry also fired on us,

Franco-German War in the Air (France)

but we got safely to the ground. We immediately tried to burn our machine, but we could not do so because the German soldiers approached, threatening to fire at us, and the petrol refusing to light. Finally my comrade fired a shot with his rifle into the reservoir. Then there was a regular hail of bullets. I succeeded in lighting the petrol with my last match. I do not know how we escaped, because we were fired at at point-blank range."

Another very interesting event of this same period, the German airmen's attempt on the French President's life when he paid a visit to Dunkirk to present their colours to the French marines, has already been told in an earlier chapter. But more than likely it was the formidable squadron of French aeroplanes that circled continuously over the heads of the presidential party which rendered them immune from attack on the part of the enemy marauders, rather than German lack of information from their spies in the French seaport.

The French were soon convinced of the wisdom of their policy of reprisals. Again, in the middle of the night of January 28, the Germans raided Dunkirk, fortunately causing little material damage and killing and wounding but few persons. However, without delay and within an hour of the enemy visit French airmen were swarming over his country, and bombs were dropped most effectively on the German camps in the neighbourhood of Laon, La Fère and Soissons—probably the centre of the greatest aerial activity in the war. For some few weeks afterwards there was a significant lack of activity on the part of the German airmen. Though one of them, venturing too far over Verdun, was brought down by the French anti-aircraft guns, and proved to be the notorious Lieutenant von Hidelin, who, the previous September, had distinguished himself by dropping bombs and proclamations on Paris, the latter inviting the citizens to surrender to the German armies "marching victoriously on Paris."

Combined with this marked superiority, natural alertness of mind began to evince itself in the work of the French airmen. In this they were helped in no small degree by the unusual efficiency of their espionage system behind the German lines and their adventurous love of flying by night. Even in a dense

The Great War in the Air

fog one day a Frenchman, flying over the clouds, took advantage of a sudden breaking of the fog to bombard the station at Lutterbach. On two occasions at least, acting on the information of their spies, French aviators succeeded in destroying with four bombs the quarters of German staff officers in Ostend. A few days afterwards news was received in Paris that three officers of very high rank had been killed by one of these bombs. During the following night a bombardment of Ostend from a height of only 1,100 metres took place. Again the pilots were acting on instructions furnished by the headquarters of the Intelligence Service, and again they found an invaluable objective. Another night raid was carried out in the vicinity of La Fère and Laon. The lights in the camps were put out at the approach of the raiders, but one of them came down to 500 metres in order to fly along within sight of the wooden roofs, on which he dropped eighteen bombs. The same night were bombed successfully an artillery park and a large enemy concentration to the north of Lille. And again two days later four bombs were dropped on Hombourg Castle in Alsace, a German general headquarters, razing it to the ground. Little wonder, then, that a German artillery lieutenant, captured at this time, remarked: "We hope a decisive action will put an end to this situation. Even at night our troops cannot rest. A French aviator dropped four bombs last night and three exploded, killing and wounding twenty horses, killing four men and wounding eight."

The French Pilots Spoil Von Kluck's Surprise

This effort reached its climax in the fighting around Soissons. Here the Germans appear to have concentrated all their crack airmen at this period. Here, too, a French airman first disclosed von Kluck's new and rapid form of motor transport of reinforcements. The enemy artillery-direction plans were unusually daring. Their method of operations was as reckless as it was useful. At first the shrapnel would appear to worry the enemy pilot. Then he would describe a circle, sweeping downwards to locate the place whence the fire was coming. He would then drift away farther until within the zone of another battery to the rear, but unless this also inter-

Franco-German War in the Air (France)

ested him he would return to his first point. Should he prove successful he dropped his smoke rockets (generally three) and shot away back to his line. The coolness of them all was amazing because they accepted chances even with angry French aeroplanes coming up rapidly against them. Many times it was to be wondered how they managed to escape the shrapnel that was obviously bursting all round. But perhaps this was explained by the fact that most of the enemy aeroplanes were already armour-plated—the German's first consideration in the air was always his person, which is why he so frequently lost his life, sacrificing capability to comfort.

On the French side also the aeroplanes were doing more than useful work. All the time both sides were aloft watching each other, even from a distance, so that the aerial drama was ever full of thrilling interest, but it was the French who worked most over the enemy country.

A typical battle for the air over Soissons occurred during this hard-fought period between three German and two French aeroplanes manœuvring about at a very high altitude, while to all appearances a snowstorm was rapidly coming up, which proved to be the case. Just as anxiety began to grow as to the fate of the two French machines if they should have been caught in the storm, they simply shot to earth in the most wonderful volplane.

A Sense of Initiative

It was this same brilliant sense of the initiative that helped to check to a large degree the haphazard, earlier individualistic methods of the French airman. He remained as much as ever an individualist, however, no longer with an indefinite purpose. He acquired balance without in any way sacrificing his old dash and daring. Thus according to the French Official of February 15, 1915, "When the weather is clear and calm our aviators frequently encounter some of the enemy's aeroplanes. In no case have the French avions failed to put the German machines to flight. As a rule the Aviatik turns about as soon as he sees his adversary. Occasionally the Germans are compelled to fight. A good example of such a fight was given by one of

The Great War in the Air

our aviators in the vicinity of Cernay on February 2. In the course of a reconnaissance he gave chase to an Aviatik and forced it twice to turn round, preventing it from flying over our lines. Just as he was about to land at the aerodrome he caught sight of another German machine flying in the direction of Belfort, and immediately set off in pursuit, forcing it to turn back. He then overtook it and exchanged a violent fusillade at a distance of 150 metres, continuing the pursuit up to the vicinity of Mulhouse. The German machine was forced to land before it could reach its own ground.

"On January 31 an avion was forced by engine trouble to cross the enemy's lines at a height of only 150 metres in the hilly country round Hartmansweilerkopf. In spite of a lively rifle fire from the woods the aviator was able to reach the Thul valley and landed in our lines safe and sound."

Another similar exploit which went to prove why the enemy were no longer able to check the movements of the French airmen occurred during the course of a reconnaissance to the east of Ypres on February 10, when the aviator refused to turn back despite the fact that he encountered over 100 shots from an enemy field gun. Again in Alsace an Aviatik, armed with a machine gun, tried in vain to stop a French aviator. In spite of the fact that twenty bullets had already pierced his machine the French pilot continued his flight, and dropped eight bombs on Bollwiller station and upon a motor spirit factory in the Bois Nonnenbruch. He ultimately returned safely to his aerodrome.

The Death of Senator Reymond

Perhaps the most tragic event of this period of the individual airman occurred with the heroic death of Senator Reymond who had done so much for the cause of aviation in France. His end was thus described by the correspondent of the *Daily Telegraph*, writing from Paris on October 23, 1914:

"While reconnoitring the enemy's lines he was struck by a Prussian bullet, but made a final effort to regain the French camp. His strength failing, the machine fell at an equal distance between the two opposing armies. The result was a fierce combat for the possession of the fallen aeroplane and fallen

Franco-German War in the Air (France)

aviator, as the Germans were quick to recognise the value of the information he had obtained.

"In the struggle the French were finally successful, and Senator Reymond was carried back to the French lines, where he had still the strength to furnish to his superiors a detailed and precise report, which proved of the utmost value. Senator Reymond died a few hours later."

His death, however, was more than avenged in the weeks that followed by those undaunted veterans, Garros and Pegoud. A close friend of both, they determined that the enemy should pay in return for his valued loss to the French Army. Roland Garros was the first to wipe off the score, and he was fortunate enough to encounter three enemy machines five days later flying towards the French lines. Singling out his victim, he dived for the formation head on. The battle took place at an altitude of nearly 6,000 feet. Garros had his machine hit several times with his opponent's bullets, but at his thirty-fifth shot the enemy machine suddenly zigzagged down for the earth. Immediately afterwards its petrol tank caught alight, and it dived for the ground a V-shaped roaring mass of flame.

Pegoud's punitive expedition was perhaps even more dramatic. A reconnaissance machine of the squadron to which he was attached brought in the information that it had discovered an enemy ammunition dump within twelve miles of their aerodrome. Immediately Pegoud set out with a full load of bombs. It was a fortunate move. *En route* he encountered two German Aviatiks in turn, and brought both of them down within the French lines. Then, not content with the morning's effort, he continued to the dump, and despite a quick fire from the enemy's guns dropped nine bombs, all of which found their objective. The successive explosions caused so great an atmospheric disturbance that Pegoud had the greatest difficulty in recovering his balance, but at last he got safely back. A few days after he brought down a German captive balloon and damaged two heavy guns belonging to the enemy. And on March 5 the French Official announced that Pegoud had been awarded the Military Medal, "for having on several occasions pursued enemy aircraft. On February 5 he attacked and brought down a German aeroplane at a great height. A short

The Great War in the Air

time afterwards he attacked two others, bringing down one and obliging the other to descend."

A temporary aerodrome had been established at — at which the famous "Ace" was then stationed, and from whence he celebrated his award in the most dramatic fashion. Every day reconnaissances were made from this aerodrome to follow the movements of the enemy troops. While on one of these expeditions Pegoud observed the movement of some guns, and thinking they might be brought into immediate operation against the French batteries, which had already been harassing the Germans, he flew low to draw their fire and so disclose their position immediately to the French. Five times in rapid succession the Germans fired on his machine, every shell exploding far behind the plane, which suffered no harm. The manoeuvre proved absolutely successful. The French gunners soon found the mark, and their trenches were not troubled by any enemy artillery from that quarter. Pegoud returned to his aerodrome without a scratch.

However, Garros was not so fortunate. On April 18 he was forced to come down at Ingelmunster (ten kilometres north of Courtrai) and was made prisoner by the Germans.

These two men were the Goliaths of French aviation; but the lesser fry, the war amateurs, who had forsaken desk, shop and business to handle a control-stick, were already accomplishing great flights. Three of these "young" aviators one day cornered a German Zeppelin over the trenches a little to the south of Mulhouse. The airship commander, who had sailed out vauntingly from the direction of the Black Forest, affected to ignore the proximity of his tiny opponents. They were equally determined that he should engage them, and, climbing up rapidly to the same altitude, a desperate battle waged for forty minutes, which was witnessed by thousands of troops in the French and German lines alike. Eventually, however, the airship scurried away to the north and succeeded in effecting its escape.

On March 24 was initiated a novel use for aircraft in conjunction with the medical services, a development that later in the war was to achieve widespread results. A military surgeon in attendance at St. Cyr was in his surgery when he was

Franco-German War in the Air (France)

suddenly rung up. A mechanic at Villa-Coublay had started up an aeroplane motor, and not getting out of the way in time had been caught by the screw. The result of the accident was that his leg was very deeply opened up. He was bleeding rapidly, and first aid methods were powerless to stop the bleeding. Would the surgeon come at once? Fortunately an aeroplane was just on the point of starting. The observing officer postponed his ascent and the surgeon took his place, and within a few minutes the latter, a little chilled by his passage through the air, was by the side of the patient and applying the ligature necessary to stop the bleeding.

The Activity of the French Air Force

These events, which at first sight may appear somewhat irrelative to the fighting actual, at least illustrate the extraordinary activity of the French Aviation Corps, certainly the largest and best developed of any belligerent at this period. The French aerial effort was divided into two main spheres of activity, a northern group of flying squadrons that operated with the R.N.A.S. along the Belgian coast in the destruction of enemy submarine bases, harbours, ammunition dumps, and strategic railway junctions, was responsible for the aerial lines immediately south of the British front, and was employed as an aerial guard to the German campaign on Paris and the whole of the north of France; in fact, was for the time being the defensive arm. Inversely, the group entrusted with carrying the air war into Germany was the southern, that was centred in and around Belfort. In the latter instance, the French having discovered the wonderful results, both military and moral, achieved by their series of reprisal raids, developed therefrom a campaign of aerial destruction on enemy military positions.

In no department of military science had the French asserted their superiority over the enemy more completely than in the air. Organised on a sound practical basis, the Aviation Corps was amply supplied with up-to-date machines. And their superiority in the matter of aerial combat may perhaps be accounted for by the fact that these machines, besides developing a speed of 115 kilometres as against the 95-100 kilometres of

The Great War in the Air

the Taube and Aviatik, possessed a field of fire which enabled the gunner to employ his machine-gun in any direction in front, behind, above, below, or on either side, whereas the German, owing to its tractor propeller and the disposition of the planes, could only fire to the rear and thus was only of use in a running fight. The French "wireless" had been developed to an extraordinary degree. It was now possible to send and receive messages from the air at a height of several thousands of feet and over a distance varying from 50 to 100 miles. The instrument was fitted in the machine at the observer's right hand, while passing over the side of the fuselage was the aerial, which was lowered immediately the machine had left the ground. By this means the observer was able to send messages to the wireless station to the rear of the trenches, which was in telephonic communication with all the batteries, and thus he could direct the artillery fire. Telephotography, that with the British service was yet unknown to any serviceable degree, was now possible from a height of 6,000 feet and over. There was a special department in the Army which, working with magnifying glasses, was able, with the aid of these photographs, to reproduce on a large scale maps of the whole system exactly to scale. The German trenches were marked in blue, like a maze of delicate veins, while the French trenches were marked in red. But, above all, the French already had developed aerial defence to a fine art.

Aeroplane v. Airship

The majority of their best aeroplanes and crack pilots were working with the southern group at Belfort. To the northern fell all the donkey work, the defence of France, and the less highly developed, but—for the purpose—equally efficient machines. One may say that after March 17 the French had fought the enemy aerial invasion to a standstill. On that date, however, Paris was subjected to the worst Zeppelin raid yet experienced in the war. Between 1.15 and 3 o'clock in the morning four Zeppelins started out from Evere and Brussels for Paris, flew over the French frontier in the direction of Compiègne, and followed the valley of the Oise. Two of them were compelled to turn back before reaching the French

Franco-German War in the Air (France)

capital—one at Ecouen, the other at Mantes. The two others were attacked by anti-aircraft guns, and only passed over the outlying districts of the north-west of the city and the neighbouring suburban districts. They withdrew after having dropped a few bombs. The damage to property was of little importance. Seven or eight persons were struck, only one being seriously injured. Various anti-aircraft posts opened fire on the Zeppelins, which were constantly lighted up by searchlights. One of them was hit and slightly disabled, immediately retiring in an easterly direction. Aeroplane squadrons took part in the action, but mist hampered them in their pursuit. To sum up, the Zeppelin raid on Paris, which the French authorities, for obvious reasons at this period of the war, described as a failure, was far from proving unsuccessful. The effect produced upon the civilian population was very marked. And steps were immediately taken to put all towns in northern France on a precautionary war footing. In normal times the "Ville Lumière" was probably one of the worst lighted capitals in Europe, being restricted to 55,000 gas and electric lights. Now commenced a regular series of aeroplane patrols over the city, night and day. Listening posts were established in all the outlying suburbs. And the number of lights in working order was reduced—more and more were extinguished every night—until but 16,000 remained. And of these but 5,500 were alight after 10 P.M. The more dangerous aspect of the raid, the effect on the population, was treated with promptly and tactfully by the Government. At the moment of the last Zeppelin raid crowds flocked to the top of Montmartre and the steps of the Sacre Cœur, bent on enjoying to the full the pleasant excitement of seeing a Zeppelin fired at with real shells and dropping real bombs. This holiday spirit was fostered intentionally, but the saner expedient of keeping well within cover was understood by the people when the dangers were quietly explained to them.

Mourmelon was the next town to suffer at the hands of the German airmen, and here the raid was of a particularly despicable nature. The objective of the enemy pilot was nothing else but the large military hospital situated on the outskirts of the town! But the Germans were soon to learn to their

The Great War in the Air

cost the undesirability of these tactics. Enraged beyond measure, every available bombing machine in France left its aerodrome that night bound on reprisal. One machine threw bombs on the German Headquarters. The projectiles all fell on the buildings in which the Imperial Staff was installed at Mezières-Charleville. Another French aviator bombarded the station of Freiburg, in Breisgau. And finally, a flying squadron of fifteen machines dropped bombs with complete success on the German military buildings of Ostend. The machines were all subjected to an intense artillery bombardment, but all returned unscathed. It is worthy of note that all these objectives were of a military nature.

Despite French reprisals, on April 29 the Germans dropped incendiary bombs on the open town of Epernay, which was exclusively occupied by ambulance and hospital establishments, and similar visits were paid to Dunkirk, Noroy-sur-Ourcq (east of Ferte Millon), Nancy, St. Die, and Belfort. Another attempt was made on Paris, April 20. In this case the German pilot, intercepted by a French squadron, hurriedly released his bombs on Villenoy, near Meaux, and turned tail for home, but was brought down by anti-aircraft fire near Braine, in the Soissons district. This time the French did not institute a reprisal campaign. Their own series of raids on German military positions was well under way, and served the double purpose of defence and offence. One Zeppelin, which on its return from a raid on Dunkirk encountered a French raiding squadron returning from Belgium, was injured so disastrously by a French aviator as to be forced to be abandoned in the wood between Bruges and Ghent. Particular attention was paid to the larger aerial bases that the enemy had established in Belgium. Ghistelles was raided some half a dozen times in a month. Twenty bombs were dropped on the Gits aerodrome, and many on Merkem, Foye, and the valley of the Aisne. Near La Bassée two German aeroplanes were forced down into their own lines. The station of Foye was effectively bombarded. The French bombarding squadrons successfully attacked the enemy reserves at Givenchy and at La Folie Wood, dispersing masses of troops in process of formation. On the evening of May 28 an extensive aeroplane raid upon Paris was frustrated.

Franco-German War in the Air (France)

At dawn a Voisin biplane was on guard over Paris at a height of 2,500 metres. About five o'clock, on receipt of telephone instructions from the Military Government of Paris, five machines took the air in succession, namely : a Maurice Farman machine, a second Voisin biplane, a gun-carrying Voisin machine, and two Nieuports.

Then an immense letter T in white canvas was stretched over the Bourget ground, the head of the T pointing in the direction where the enemy machine was perceived. The pilot of the first Voisin biplane, hearing the reports of the anti-aircraft guns, and noticing the enemy aeroplane, darted towards the German and pursued him as far as Senlis, without being able to overtake him.

The Story of a Paris Raid

The pilot of the Maurice Farman, who was flying above Paris, hearing the cannonade, returned to the Bourget ground and, noticing the signal, set off for Senlis, but did not see the enemy. The second Voisin biplane was above the northern district of Paris. He sighted the enemy 100 metres ahead, flying 500 metres above him, and went in chase. His observer opened fire with a machine gun. The pursuit was continued as far as Senlis, but the enemy was not brought down. The other Voisin, while mounting into the air, saw the German at a greater altitude and opened fire at a thousand metres, noticing splinters of projectiles, and at once made for Fontenoy in order to cut off the enemy's retreat, but did not arrive in time. The French pilot sighted the enemy and pursued him as far as Senlis, without overtaking him.

Six aeroplanes succeeded, with the indications given by bursting shells, in locating the first enemy machine, but could not overtake it for the purpose of fighting and destroying it.

The second German machine, which followed ten minutes behind the other, seems to have turned about after having passed Chapelle en Serval.

Another matter which came within the scope of the northern group was the German mystery gun that was daily shelling Dunkirk from a distance of over twenty miles. Though as yet unable to locate its exact position, it was now believed, nine

The Great War in the Air

shells only having been fired in the second and third bombardments, that the gun had been damaged by the nature of its fire, which the more powerful guns could not stand for long, or that the continued flight of the French aviators in that region had put a stop to the firing. The latter was the more probable reason.

While this more than useful reconnaissance was being carried out along the Belgian coast, the southern group—the real offensive wing of the French Aviation Corps—was not inactive. At the second battle for Lille (May, 1915) the German guns, which had opened in a fierce artillery bombardment, were soon located and put out of action by the French airmen. In the Champagne district their pilots asserted their supremacy over their German rivals in no doubtful manner. French aviators were particularly active in Alsace, speeding out like swallows in their dawn and twilight reconnaissance flights. A squadron flew over Bartenheim and Habsheim, where bombs were dropped on the new enemy aerodrome. Another raid was made on Muelheim and Krotzingen, a third went over to Guebwiller and Colmar, and a fourth to Chalampre (Eichwald), the last station in Alsace, on the banks of the Rhine, opposite Neuenburg, the town in Baden-Baden where were situated important subterranean defences.

The Famous Gilbert

Individual exploits, as in the north, were not lacking. The famous French airman Gilbert, of Paris-Madrid fame, after an Homeric battle in mid-air, brought down an enterprising German who had come to spy on the fortress at Belfort. It was at sundown of a June evening that his approach was reported at Gilbert's aerodrome. "Where is he? He is mine," immediately exclaimed that resourceful pilot. Within ten minutes his machine was but a speck against the evening sky, and he came across his adversary over Asbach, in Alsace. The battle soon began. Gilbert kept on climbing, and passed from one side of the German machine to the other. The enemy pilot, who was rising spirally, had opened fire with his machine gun. Gilbert was by this time also firing, and leaving the German for the third time on the left he fired twelve shots from his

Franco-German War in the Air (France)

machine gun. The enemy airman was seen to throw up his arms. His machine dipped and crashed to the earth. The bodies of both pilot and observer were unrecognisable, and the machine was smashed to atoms.

Another wonderful feat performed by a French airman was that of shamming death by falling headlong in his machine, and thus trapping two German airmen. The Frenchman was reconnoitring with an observer in the Woivre region with the object of discovering the exact emplacement of enemy batteries. While so engaged his machine was the object of a vigorous shelling by the Germans, who ultimately sent up an Aviatik machine to attack him. The Frenchman, by successful manœuvring, flew over the German, who promptly took flight. An accident to the French engine obliged the airman to descend abruptly. The enemy pilot, believing him to have been killed, came down hurriedly and landed almost alongside the fallen machine. The Frenchman, simulating death, allowed the German pilot to approach, and then suddenly shot him through the head and ran to the Aviatik and shot the observer. The Frenchmen returned to camp, the pilot flying in the German machine, and his observer piloting the French machine.

Here are the details first-hand from the lips of a French pilot who participated in one such fight. "I saw an Albatross coming from the German lines at Laon, making for Chateau-Thierry and Paris," he says. "I gave chase. The German was eight thousand feet up; I rose to nine, and, as I had a faster machine, I rapidly overhauled him. We drew within thirty feet of the Albatross, but had such way on that we shot right past, and I got a bullet in the shoulder which, however, did not prevent me from continuing in the chase. The Albatross then tried to escape by sinking quickly, but I flew over him and my lieutenant got in a last volley point blank.

"The Albatross dipped and plunged headlong to the ground six thousand feet beneath. We followed it with our eyes and saw it strike the earth, crumple up like a ball, and bound along the hillside like a rabbit. We descended in spirals. The pilot had been thrown out, and lay a few yards away. The observer lay crushed under the engine.

"We found papers in his pocket bearing the name of

The Great War in the Air

Lieutenant von Bülow, of the Imperial Guard, Berlin. The sight sickened me at first, but when I found the ten large bombs and forty grenades on the Albatross I was glad, for I realised that we had been the means of saving the lives of the innocent victims for whom these bombs and grenades had been intended."

In the Vosges, next to the Chasseurs Alpains, the French aviators from Belfort were the most feared by the Germans of all branches of the French Army. Day after day they set out on their various missions across the Rhine, or along the foothills of the Vosges, and returned with valuable information. The German military authorities soon realised that no great military movement, or concentration of troops, could be carried out without its being known to the French through the observations of their aviators. One day an entire squadron came over the crests west of Dammerkirch and steered north in the direction of Mulhausen. Every German battery opened fire on them, but they seemed to pay no attention to this. The inhabitants had been warned by the blowing of whistles, and had taken refuge in their cellars. But nevertheless the French airmen succeeded in doing a lot of damage of a military nature to the town.

CHAPTER XII

THE FRANCO-GERMAN WAR IN THE AIR (GERMANY)

Gigantic Nature of Germany's Aerial Effort—Precautions against Allied Raids—Psychology of the German Air Command—The "City of Dreadful Night"—German Aeroplane Raids—Experiments in Bomb-Dropping—Zeppelin Spring Campaign—Disasters with the Giant Airships—The Fine Imposed on the City of Brussels—Friedrichshaven—Development and Construction of the Super-Zeppelin—The May Zeppelin Raid on Calais.

AT this period one cannot forbear a word of praise and admiration for the gigantic nature of Germany's aerial effort. The Austrian, Turkish and Bulgarian air forces, woefully equipped and worse supplied, were supplemented with everything (from pilots and observers to the smallest spare part of a machine) from Johannisthal—the Hendon of Germany. On the west the Russian wedge was daily driving farther and farther into the heart of East Prussia, yet at no period did the German airmen forgo their mastery of the air on that front. As we have already seen, an extensive plan of aerial bombardment, that extended to Paris itself, was being carried out in northern France. German aeroplanes were busy day and night on the aerial bases of the Allies along the Belgian coast. At sea the Zeppelins and seaplanes were carrying on the defensive patrols of the German coasts, that were all too impossible to the High Seas Fleet bottled up in Kiel Canal; while the Zeppelins in particular were venturing even farther afield and raiding British shores to some effect. The fast-growing pride of Germany in her air service was warranted.

Perhaps the least important of these many branches of activity was the sea patrol. German seaplanes and Zeppelins were constantly being sighted by the British surface patrolling vessels far out over the grey wastes of the North Sea, but no encounters of any importance occurred. Apparently the enemy

The Great War in the Air

aircraft at this time were not anxious to seek fight. In much the same way an unusually formidable wing of British seaplanes at Dunkirk held the German sea craft activity well in hand. Then in these early days, the seaplane personnel was employed in the most part in the defence of Zeebrugge from attacks from sea and air—an onerous duty. For this purpose the enemy employed a captive balloon carrying two officers, who for hours on end searched sea and sky for warships or aeroplanes. From dawn to sunset it would be swaying at 1,200 feet in a light breeze over Zeebrugge. Provided with a telephone, the observer immediately gave warning to the workmen who were engaged at the electric power station and mole, and who made for the bombproof shelter on the first appearance of hostile warships or aircraft.

It was not long, however, before the German seaplanes developed their own particular line of Kultur. This was to attack and bomb unarmed merchant vessels at sea. During March several occurrences of this nature were reported from various quarters. The Belgian relief ship *Elfland*, bound for Rotterdam, when near the Maas lightship, had five bombs dropped on her, but fortunately escaped damage. The Dutch steamer *Zevenbergen* was also attacked off the North Hind dune, one bomb exploding about seven yards from her stern. Nearly at the same time and locality the *Pandion* had seven enemy bombs dropped on her. The *Teal*, on arrival in the port of London, reported having had four bombs dropped on her some thirty miles off the Dutch coast. It was also reported that the airmen used their machine gun. In the end the American Government, through its Minister at the Hague, Mr. Van Dyke, was moved to send a strong protest to Germany against the dropping of bombs near the relief ships bound for Belgium. After that the Norwegian steamer *Diana* reported having had a shower of darts dropped on her decks from a German aeroplane while lying in Calais docks.

Poison from the Air

One of the German seaplanes, while making a reconnaissance flight in the direction of the Hook of Holland, dropped a small mysterious package which, when picked up later by

Franco-German War in the Air (Germany)

Dutch trawler, was found to consist of four large glass tubes containing asphyxiating gas. The tubes were confiscated by the military authorities at the Hook for examination.

A large German seaplane was wrecked in the sea some miles west of the Skaw, and was salvaged by the fishing cutter *Ann Kirstine*, which took her remains into Frederikshavn. Parts of the wings, the whole rudder, and some tools which were found indicated that it was a new machine, and that the disaster was of recent occurrence. On May 25 a British destroyer landed at Harwich a German sub-lieutenant and his mechanic who had been taken off a German seaplane in the North Sea. The machine, having had to come down through engine trouble, had been drifting about nine hours. On the other hand, the Germans claimed, in their communiqué of July 30, to having forced a British machine to descend to the water's edge off Belgium, and captured the crew of two aboard.

The organisation behind this splendid effort was developed to the highest degree of efficiency. It has already been noted that the supply of machines and pilots had almost doubled itself in a year. The Germans were beginning to establish in Belgium a series of great aerial bases, of which Ghisteltes—afterwards to play so large a part in the R.N.A.S. reports—was the centre. Subsidiary stations were established at Ghent, Namur and Liège respectively, to which towns were soon dispatched large squadrons of new and highly developed Aviatiks, capable of making raids of over 100 miles beyond the Allied lines. Then the enemy set out to make his new positions as impregnable from the air as was humanly possible. Though, as after events were to prove, he may as well have saved himself the trouble.

Elaborate precautions were taken to protect the hangars and petrol bases against bombs, and also a long series of night signal stations was established. These were furnished with large and powerful searchlights, by which intercommunication, by signalling into the sky, could be maintained between the various bases. Several machine guns were mounted on the old belfry at Bruges against any raid that might be made by the Allies' aircraft. They were already putting up new Zeppelin sheds there, and the new aviation centre outside the town was

The Great War in the Air

almost complete. At Brussels—such is the irony of war—the field artillery captured from the Russians was employed to strengthen the anti-aircraft defences of the city.

The German Mentality

The curious German mentality is nowhere better seen than in their attitude towards air-raiding. Every raid directed against them was on "an open town," whilst all those they instigated achieved "first-class success against objects of supreme military importance." They even succeeded in justifying the bombing of hospitals, to their own satisfaction if not to that of the world.

Facts must speak for themselves. The enemy High Command was not without its customary bombast with regard to this latest branch of its military machine, and the airmen themselves were imbued with an undue sense of their own importance.

In the British Official of February 16 there appears the following: "In spite of disclaimers that the German activity on the Kaiser's birthday"—it proved none too successful—"had no connection with that event, some people in Germany were evidently led to expect great successes on that anniversary. Here is a letter, dated January 25, which was found on a prisoner:

"It appears that for the Kaiser's birthday there is going to be a great attack. All the aviators and all the Zeppelins will be let loose against France. On the one hand the engineers will do their utmost, and on the other hand the artillery, and then a tremendous assault.'"

About this time the German airmen developed a curious vanity of dropping their own signed photos on the positions and towns that they had bombed. Though, at the same time, it must be admitted that they combined this peculiar habit with the very humane practice of dropping letters giving news—in some cases delivering autograph letters—of British air prisoners in Germany. In every instance British airmen flew back over the German lines to drop a letter of thanks and acknowledgment. The taint of the raider was lessened considerably by these kindly actions. But it is with the raids actual that we would deal.

Franco-German War in the Air (Germany)

Making use of a captured French aeroplane, still marked with the familiar red, white and blue rings, a German aviator attempted to bomb Paris. But, fortunately, his treachery proved of no avail against the watchful defence squadrons. But again he returned, and this time made for the direction of the Eiffel Tower, dropping eight bombs. The first fell in the Seine within a few hundred yards of the tower, the others fell no nearer. One pitched in a square, which was crowded with children playing. Another raiding squadron, having failed to reach England and to vent its wrath, dropped several bombs in Malo-les-Bains, an undefended French seaside resort. On the Russian front another German airman bombed a cinema theatre full of people at Girardor, and killed twenty-five women and children! Enemy raiders constantly flew over Swiss territory, in one case bombing and destroying a small farm and killing the inhabitants. On March 5 occurred the most despicable raid of all. In the middle of the afternoon four German Aviatiks flew over La Panne, a small bathing-place on the French seacoast. They loosed several bombs, all of which fell into the part of the town that is farthest from the sea, towards the Furnes and Adinkerke roads. One bomb carried away the cornice of a villa, burst and killed a nurse and a little boy that she was carrying in her arms. Returning over the town the airmen did still more damage and claimed further victims, in particular the wife of a doctor. Afterwards the air squadron made off over Bray dunes, but there they found themselves face to face with British and French aeroplanes, and they immediately swerved off. In face of these undeniable facts the enemy, on January 18, had the impertinence to issue the following with regard to the French raid on the military fortifications of Karlsruhe:

"To-day the open town of Karlsruhe, which is far from the theatre of operations and is not in any way fortified, was attacked with bombs dropped by an enemy airman. As far as is yet known 11 citizens were killed and 6 injured. No military damage was caused." (*sic*).

This campaign of humbug is reiterated (March 26) with the following: "To emphasise our reply to the misdeeds of the French airmen in the open Alsatian town of Schlettstadt more

The Great War in the Air

forcibly a few large bombs were dropped during the night on the fortress of Paris and the railway junction of Compiègne by our airships." Again (April 12) in the "wireless" news sent out from Berlin there was the following :

"In the western theatre of the war the French assert that they dropped 150 bombs on the railway station near the beach in Ostend, and the foundry in Bruges. As a matter of fact, nine bombs fell in the neighbourhood of Ostend and two at Bruges, without doing any damage.

"In return we dropped numerous bombs during last night on the villages of Poperinghe"—the present writer was there at the time, and can vouch that it was an undefended non-military town—"Hazebrouck and Cassel, which are occupied by the English." And once again, a crowning piece of bluff, an attempt to justify the vindictive series of raids which Germany herself had initiated, on June 4 the following is emphasised :

"Our airmen threw bombs on the fortified places of Grave-lines and Dunkirk, and on St. Omer, which is on the enemy lines of communication. Several hits were made at the hostile aerodrome north-west of Fines."

Truth to tell, the enemy had already begun to realise that this contemplated campaign of "terrorism" was a game at which two could play. On more than one occasion the spectacular activity of the German aircraft in the Ghistelless-Zeebrugge region was due to false alarms, which they were constantly receiving from farther down the coast and which but emphasise the hysterical attitude they had adopted to air-raiding, which was not their own. The Kaiser's headquarters in particular—an establishment that included 1,200 souls, consisting of thirty-six chiefs or department heads, clerks, secretaries, and garrison, the whereabouts of which was one of the most profoundly kept secrets of the war—was constantly guarded by two strong squadrons of aeroplanes, consisting of the pick of the enemy air service. The panic in the Rhine provinces, following the brilliant British raid on the Zeppelin station at Düsseldorf, was indescribable. Two German airmen, returning from a reconnaissance patrol, were themselves shot down by indiscriminating German anti-aircraft artillery.

Franco-German War in the Air (Germany)

Some estimate of the heavy casualties of enemy airmen may be gained by the anticipatory reassurance issued by the Imperial Staff (July 2) which runs: "Since the commencement of the great struggle at Arras our airmen have been contesting with enemy aviators the dominance of the air. This struggle has entailed losses for both sides, and ours have not been in vain. For some days it has been obvious that we prevail." And the list, an unusually heavy one for those early days, included the names of seven aviators who had been killed, as well as nine wounded and eight missing.

If the list of casualties was heavy, however, it was in but slight proportion to the extent of the work carried out. Night and day, in storm and fine alike, the enemy were raiding the Allies' positions along the Belgian coast. The town of Dunkirk is a very fair example. This "City of Dreadful Night" during a period that extended from January 1 to June 30, 1915, was raided no less than twenty-five times. The principal attempts were as follows:

Date.

Results.

January 10.

January 14.

January 18.—Sixty German bombs dropped on the town and its suburbs.

January 24.—Ten German aeroplanes destroy a large military store.

January 28.—Night raid by five aeroplanes.

February 21.—Zeppelin raid.

March 18.—Zeppelin raid.

March 28.—German aeroplanes bomb Dunkirk and Calais.

May 26.—Night raid.

June 8.—Reprisal raid for Warneford's Zeppelin.

July 30.—Thirty bombs dropped on British aerodrome at St. Pol, outside Dunkirk.

August 13.—Aviatik midday raid.

Though this list is an unusually heavy one it by no means includes the minor individual and unsuccessful raids that were made on this unfortunate city. It would be no exaggeration to say that hardly a day passed in the first four months of 1915

The Great War in the Air

without hostile aircraft flying over, even though they did not always drop bombs. On more than one occasion these latter visits were paid to direct the fire of the German giant howitzer that was bombarding Dunkirk at this period (March-April). One day the bombardment commenced at daybreak and lasted until about 2.30 P.M. Another day, during a period of fifteen minutes, seven 305 calibre (12-inch shells) fell on different points in the city, and German aircraft hovered over the town the whole time watching the effect of the shells. This gun was ultimately located and destroyed by a French airman. He descended to within 150 metres of the concrete casemates near Dixmude, under which the gun was hidden, and took photographs which enabled him to fix with absolute precision the map position. With the help of this information over 200 shells were dropped on the casemates, and the gun was destroyed.

An Early Raid on Etaples

Farther down in the Flanders plains the German aerial effort continued unabated. On January 25 a German airman successfully bombed and killed a cow at Borre. Another blew up an old disused gasometer at Cassel—bomb-dropping was not a gift with the enemy airmen, who rarely hit their real objectives. At Hazebrouck, where the British General Headquarters was situated at this time, on February 5 a Taube dropped bombs on the railway station for over half an hour, and though falling all around they did not reach the target. But a few days previously (January 29) one of the enemy's airmen carried out a very daring flight as far as Etaples, a dozen miles farther along the coast than Boulogne. The noise of the aeroplane engine was considerably deadened by the strong wind which was blowing from the sea, so that the machine, flying at a great height, was able to approach the town unnoticed. The airman, with great skill, planed down when over the town and, bringing the nose of his machine into the wind, hovered over the goods yard adjoining the railway station sufficiently long to drop a couple of bombs.

Havre and Paris were bombarded on the 17th and 18th of March respectively, with total casualties of eight killed and twenty children wounded, but no military damage was achieved.

Franco-German War in the Air (Germany)

While, according to the *Berliner Lokal-Anzeiger*, describing the fighting round Ypres in May: "Every trench and defence work in the enemy's position and our own is carefully drawn on the map after observations and photographs taken by aviators." The German aerial activity reached its highest pitch of intensity in the fighting before Amiens in the middle of April. Amiens was raided unmercifully. On the morning of April 17 there was a raid upon the town which exceeded in its murderous effects anything of the kind that had so far been experienced, and the havoc caused by the German bombs tended to confirm the opinion that a much more powerful projectile was now being used, although whether in respect of its size or the nature of the explosive it contained was not so far clear.

It is worthy of mention, however, in this connection that for some time, with the benevolent assistance of the Imperial Government, a certain firm in Zurich had been engaged in perfecting an arrangement that would both enable an aircraft to carry bombs of greater weight than hitherto and to direct their fall with greater accuracy. It was claimed—wrongly, as we will see later on—that they would hit the objective with perfect sureness from whatever height or whatever pace they would be going, and also that the position of the airship or the vibration from motors or other causes did not affect its precision. The aim was directed by means of field-glasses. In connection with this there was another automatic discharge device, by means of which bombs or shells with explosives could be fired automatically at the average rate of eighteen to twenty bombs or shells per minute. The shells or bombs, moreover, were made to drop on all occasions vertically, so that they were sure to explode, and this whether the airship was in motion or at rest. Even if such shells should drop in the water they could be arranged so as to explode when two metres beneath the surface, and thus damage the sides of a ship.

Bombing Amiens

Towards five o'clock in the afternoon a second aeroplane bombarded the defenceless open city of Amiens, which had not even the merit of being an important military centre. This pilot contented himself with two bombs. The first fell on a

The Great War in the Air

cheap tenement house which it wrecked, decapitating a woman. The second bomb fell in the garden of the curator of the Picardy Museum, but did no harm. In all, fifteen people were killed or wounded by seven bombs.

Meanwhile Calais was also coming in for attention, an Aviatik machine slipping through the guards and commencing its operations at the hour when workpeople were hastening to work. Two bombs fell in the town, causing, however, only material damage, before the artillery opened fire, upon which it fled rapidly, throwing other five bombs as it went. The new Swiss invention was employed in every one of these raids, with apparently great success.

These bomb-dropping sights, however, were intended primarily for use with Zeppelins. The airships, which in the interval had been transferred almost entirely from the military to the naval authorities, were still the principal German aircraft of the war. And the Zeppelin it was that was intended to bring England to her knees. But certain events in the aeroplane campaign in northern Flanders yet remain to be recounted before we deal with this somewhat extensive Zeppelin campaign. Nancy was raided by large squadrons, and with disastrous results, on at least four occasions: April 21 and 28, May 16 and August 29. The German activity in the air in the area of the British advance round La Bassée was tremendous, and their machines were constantly scouting in all directions. Then one night the British aeroplanes made a concerted raid on Ghisteltes. The enemy were far less active for some weeks, for when the raid was over nothing remained of the new aviation station beyond some hangar walls, half consumed, under which lay the debris of aeroplanes reduced to fragments by the British bombs. A German officer taken prisoner near Dixmude admitted that the positions at Bruges and other places inland, believed to be unknown and immune from aerial attack, had suffered heavily from bombs.

Paris, on May 15, was treated to as fine a spectacle of an air duel as had yet been seen in the war. A powerful German monoplane, flying at a very great speed, circled over the city, and a French biplane pluckily but ineffectually gave chase to it. All over Paris people gazed on at the duel, which had a

Franco-German War in the Air (Germany)

brilliantly coloured sky as its setting, and wondered whether the Germans had not now some new and specially speedy type of aeroplane that far outclassed the latest French models. At the week ending June 2 the Germans made a determined attempt to cut through round Dixmude from the north-west, having prepared the ground by a severe bombardment, in which their artillery was helped greatly by daring reconnaissances by their aviators who flew low over the Belgian trenches, peppering them with bombs and dropping smoke indicators as range markers. The German communiqué of July 9 announced: "Our aviators were yesterday very active. German aircraft dropped bombs on the Landguard Fort of Harwich and upon an English flotilla of destroyers. They also attacked the fortified railway works of Nancy and Dombasle, and the barrier fort of Remiremont." After the fall of Kovno German aviators were employed by the General Staff to drop red and yellow leaflets, containing the full details of their capture, behind the Allies' lines in the Hill 60 region on August 29. The red leaflets were printed in English, the yellow in French.

The Zeppelin Spring Campaign

"Victory will rest with the fighting instrument which is most mobile, most rapid, most invulnerable, and most audacious. The Zeppelin is a delicate monster, fragile and condemned to inability to ascend to a great height under penalty of a dangerous condensation, which may bring about a catastrophe." Thus wrote General Cherfils, in the *Echo de Paris*, April, 1915, in reference to the concentration of German airships on the Belgian coast for the purpose of raiding Paris. At no time in the whole war, with the possible exception of the autumn of 1918, was Germany so woefully lacking in man-power as in the spring of 1915. With two long and extensive fronts and the necessary reserves to support, exclusive of the training of new units and the making of munitions, the German High Command must indeed have set great store by the Zeppelin as a military machine.

The giant airship, unlike the heavier-than-air machine, necessitated a veritable army for its satisfactory upkeep. There were sheds, often many hundred square feet in area, to be

The Great War in the Air

erected and maintained. The ship itself, a delicate, expensive and intricate craft to construct, necessitated a small army in its construction; while many hundreds more trained mechanics were required for the rigging and the mooring of the Zeppelin when in action. Why, then, under these circumstances, did the enemy persist in developing this inordinately expensive craft of war? The answer is not far to seek.

The same German self-assurance that had been culpable of the blunder of imagining that England would not support her Ally France in the case of an enemy invasion, thereby wilfully ignoring her "scrap of paper" treaty, now anticipated that, with this novel method of invading Britain from the air they would rapidly achieve such a moral effect upon the British civilian population that they would force the Government into signing a peace wholly favourable to Germany. The enemy made his full quota of blunders in the Great War, but never one equal to this. Germany was talking of the Zeppelin devastation of London already as though it were an actuality. Certain people even went so far as to predict an actual date of the final surrender of the British Empire, due to this cause—June, 1915.

"The work of our submarines," said a prominent German official to a distinguished neutral travelling in Prussia in April, 1915, "is small compared with what the Zeppelins are going to do. You have observed that the Zeppelins have been more active and are going still farther and wider—and nearer London. Thus, you see, great things are in preparation. The British did not believe in the power of our submarines. Now they have to. They have not believed in any real military power in our Zeppelins. That time will come!"

"Well," said another of the party, "there has long been talk of that. It is no good to talk."

"But I know," replied the first. "Things have become different now. We will hit London. New machines, new bombs. I can tell you a secret. One of our foremost chemical works has been making something quite new for the Zeppelins. You know the 'stink-bomben' (asphyxiating bombs). Our chemical resources are not yet exhausted. And I have seen the new Zeppelins." The reply to our pertinent query is to be

Franco-German War in the Air (Germany)

found in that single statement alone. Germany was as certain that her Zeppelins would reduce London to a state of mad panic as she had been certain that her armies would be in Paris with the fall of the autumn leaves.

And then came General Cherfils' authoritative anticipation to confront them. Had the enemy but paid better heed to those few sentences she might have saved herself the most disastrous moral and military defeat of the war. For, from now on, the giant airships met with nothing but disaster. No less than fourteen had been either lost or damaged beyond repair before June 30, 1915. The L1 disappeared in a storm on September 9, 1915, and the L2 was destroyed by fire on October 17. The British plane raid on the Friedrichshaven sheds in the first week of December destroyed the framework of an almost completed new type of Zeppelin. Fishermen from Noorbwyk the following January reported having seen another Zeppelin foundering at night in the sea. They were unable to render any assistance, as the weather at the time was very stormy. But from their description the wrecked ship must have been a Zeppelin; while in two successive days, February 17 and 18, Germany lost two of her latest craft, the L3 and the L4. The L3 fell in flames on the Danish island of Fanoe. And a few hours later came the news that a second airship—the L4—had been abandoned off Blaavland on the west coast of Jutland. The former craft left Hamburg at four o'clock the same morning and, cruising off the north-west coast of Denmark, her engines had failed one after another, until with a sudden crash she had landed on the beach at Fanoe Island, snapping in two as she struck the earth. Immediately her captain had set fire to his craft, "in order," he declared, "to prevent her being blown farther ashore and imperilling lives and adjacent buildings." The ship was utterly destroyed in any case. And the crew, after having landed their ammunition and bombs, were interned for the night in a local hotel. The L4, on the other hand, one of Germany's most lately constructed Schutte-Lanz, was returning south when she ran into foul weather, first fog and then heavy storms of sleet and snow. Eventually it was decided to abandon her. Two of her engines had already failed, and when over Boersmose, near Blaavland, on the west coast of Jutland, the

The Great War in the Air

crew jumped overboard from the airship, leaving her aloft to drift at the mercy of the elements.

Disaster Strikes the Zeppelins

This was but the first of a long series of disasters, that struck deeply at the moral of the German air service. On March 8 the captain of a Danish steamer sighted the wreck of the *L9* in the North Sea, twenty miles north of Wimereux Bay. The airship had been wrecked in the violent hurricane overnight, and for three days three of her companion ships were hovering overhead in a vain attempt at salvage. This same storm blew away the Zeppelin sheds at Cologne, wrecking one Zeppelin and seriously damaging another. In the neighbourhood of Tirlemont, in Belgium, yet another airship was caught in the hurricane and thrown violently down into a neighbouring forest. Forty-one Germans were on board. Nine were found dead, and 29 so seriously injured that 12 died the following morning. So furious had the Germans grown by this time at this series of mishaps that every Belgian seen taking photographs was immediately arrested. According to the *Tyd* on April 14, a Zeppelin, fired at and damaged near Ypres, managed to return to Thielt, where it landed in a battered condition. Six days later a Zeppelin which made a raid on Bailleul came to grief on its return journey. The next morning at dawn two aeroplanes could be seen hovering above a point near Ghent as though searching for something; and when the milk-carts came into the town they told the inhabitants that an airship was wrecked at Aeltre, between Ghent and Bruges. This ship was damaged beyond repair, and the crew sustained casualties of 11 killed. During July two further Zeppelins were lost. The first exploded as it was leaving its shed at Brussels; and the second, while bound on a raid, developed a defect in its engines and fell upon a farmhouse at Assenede.

By July, 1915, the losses in craft exceeded out of all proportion the military damage effected by the Zeppelins. Doubts as to their practicability as vessels of war were already being openly expressed even in the highest official circles. The city of Brussels had been fined £200,000 by the military authorities for the presumed assistance that the inhabitants had rendered

Franco-German War in the Air (Germany)

the British naval aircraft in their raid on the Evere Zeppelin sheds in early June. £1,000 had been offered by the military governor of the same city to anyone capturing an Allied airman dead or alive, and the Kaiser had promised to confer a special decoration of the second class of the Order of the Red Eagle on the first German airman who succeeded in dropping bombs on London. Other lesser, but yet unusual, honours were promised to German aviators who succeeded in dropping explosives either on a British warship or on some other town in England. Still, the Zeppelin campaign appeared to make no headway. Thus the Germans were faced with two alternatives, to give up further Zeppelin raids or to make them more efficacious. The first alternative would have hurt their pride too much. It would have been an avowal of their mistake. So they had to look for new and ingenious means of remedying the defects in their giant airships. So great was their fear of the British raids, however, that they resolved to withdraw their Zeppelins for the time being from Belgium and proceed with the difficult task of improvement.

The Zeppelins flee from Belgium

Meanwhile, most of the new craft were withdrawn from the new bases in Belgium to the floating Zeppelin town on the shores of Lake Constance. Friedrichshaven was still at this time, as it had always been, the headquarters of the German lighter-than-air fleet. But this withdrawal in itself amounted to an admission of defeat. No less than half a dozen giant airship sheds had been erected in the neighbourhoods of Antwerp and Brussels, and every one of these had to be abandoned. Included was the Berchen St. Agatha base to the south of Antwerp, which included a new Zeppelin shed built of iron and concrete, with mica windows, and a strong sheet iron roof. The sheds at Schaerbeek, near Brussels, and at Ghistelles, together with six wooden aeroplane sheds at the latter station, had already been destroyed by British airmen. The large airship shed to the north-east of Bruges, that accommodated two ships, was taken down bodily, and the material conveyed back to Germany. Another shed in the neighbourhood of Bruges was being run up with feverish rapidity, at a point a

The Great War in the Air

little outside the town, to the south-east. In the erection of this shed a serious obstacle was encountered. A work of such magnitude necessitated the employment of hundreds of carpenters and other artisans. Civilians were commanded to assist in the task. Most of them, however, refused so to do, their reason being the fear of the shed being made the objective of Allied bombs. Threats that they would be shot if they did not obey forced a good many to the job. Others managed to escape from the town, and consequently great difficulty was being experienced in finding the necessary labour to complete the construction of the shed. At last, when everything was well under way, the whole construction was suddenly countermanded. The big new base at Ghent, capable of housing four Zeppelins of the latest and largest type, was likewise abandoned.

At Friedrichshaven, however, there had been for some considerable time unrest amongst the workmen. Three months previously (December, 1914), together with their co-workers from the neighbouring towns of Meersburg and Lindau, the working people were asking when Count Zeppelin would keep his promise to the Kaiser. The Count had promised the Kaiser to make an aerial raid on England, and especially upon London, "before the end of the year." Zeppelin made, however, two conditions, first, that he should be given a good base near the North Sea, and second, that he should be supplied with enough money and materials to build a fleet of at least ten new and exceptionally powerful Zeppelins, which could remain in the air for at least thirty hours. The Emperor had agreed, and the funds were voted for "special service." For the time being the workmen had been satisfied with the raids on England, but now they were demanding when Zeppelin's second promise, "to end the war by means of Zeppelins," was to be fulfilled. The Count was unable to reply to this naive query. And the workpeople had resultingly lost some of their previous fanatical enthusiasm in their work. The output of airships suffered accordingly.

Nevertheless, by the end of July the Z24 and the Z25 had been taken over by the naval authorities on completion. Nos. 26, 27, 28 and 29 were sent out on various dates between August 10 and October 15, 1915, and Z30 was due to be sent out on November 5. All these Zeppelins were of the same type.

Franco-German War in the Air (Germany)

Certain slight improvements had been effected in this later class. The climbing powers had been increased by some twenty-five per cent., as also had the speed of the engines. Supplemented by the combined efforts of the Höchst and Badensche chemical factories, experiments were being carried out with a certain wild development, that aimed at controlling for a distance of over two miles the direction of bombs, by means of the distribution of Hertzian waves. At the same time a number of interior compartments were added in the hope of losing as little gas as possible at each breach. The number of machine guns on the top of the Zeppelin had been augmented, and a kind of "nebel-bomb" (fog-bomb) had been experimented with to enable Zeppelins to make raids over enemy countries in the day time. When the bomb was dropped from the airship it exploded at a calculated distance from the ground and, with incredible rapidity, sent out a fog which absolutely shut out the craft from view of the anti-aircraft gunners. To sum up, the Germans had succeeded in constructing Zeppelins a little better armed, a little larger, with a slightly greater climbing power, a little less vulnerable and somewhat faster in the air.

The development of the new craft by stages was most interesting. A correspondent of the Bologna newspaper *Resto del Carlino* described a visit to the Zeppelin building-yard at Friedrichshaven in November, 1914 as follows. He said that at the beginning of the war Germany had thirty Zeppelins in service. Since then work had gone on night and day, 12,000 men being employed in building additions to the air fleet. On an average Friedrichshaven could turn out two airships a month at this period, and the Germans hoped to have completed by the spring of 1915 a further fleet of eighteen dirigibles intended for an expedition against England. Each airship was 462 feet long, 49 feet in diameter, with a crew of thirty. The armament consisted of a quick-firing gun and fifty bombs. But already this type of craft had developed to a species of super-Zeppelin that differed considerably in shape from previous craft. The rear part of the envelope was blunt instead of being pointed. This ship possessed two armoured cabins containing small guns, and had three triple-bladed propellers, which gave a greatly increased speed.

The Great War in the Air

Every three weeks a new ship was dragged out from its closely guarded shed and put through its paces over Lake Constance. Owing to the spy scare great care was taken to keep it away from the Swiss shore. And for the same reason in daylight no practice in bomb-dropping was indulged in. But at night trials were conducted with projectiles and searchlights, and the detection of floating targets, which the pilots and observers set themselves to locate on the German part of the lake, between Uberlingen and Constance, after which trials the new Zeppelin immediately set out for an "unknown destination." This "unknown destination" was part of the mystery. The workmen did not know where the results of their labours were stored. But later events were to reveal that this unknown base was situated at Baden-Oos, near Baden-Baden. And it was from this shed that many of the Zeppelins from time to time seen over the Black Forest set out on their flights.

At sea the Zeppelin commanders appeared to be emulating the policy of their confrères of the seaplanes. Their principal occupation seemed to be the holding up of neutral merchant shipping.

Ashore the biggest event of the Zeppelin campaign of spring, 1915, was the raid on Calais (May 17). Before that, attempts were made on Calais (February 21) when a Zeppelin, accompanied by an aeroplane, appeared about 4 A.M., over Sangatte, near Cape Blanc Nez, coming from the direction of the sea. It then circled to the left, and several bombs were dropped on Fontinettes, a residential suburb on the extreme outskirts of Calais, five civilians being killed. The airship next passed over the eastern portion of the town in the direction of Dunkirk, and was fired upon, but succeeded in escaping. Another airship which appeared over the French lines on March 10 was brought down and captured. The hinder part of the envelope was seen to break away from the rest, and the Zeppelin fell rapidly to the ground in a collapsed condition.

Calais was again raided on March 18. The night was very calm and a thick mist prevailed, so that, when it was reported from Mark, between Dunkirk and Calais, that a Zeppelin had been sighted, the searchlights were handicapped in their work, while the anti-aircraft guns were unable to render effective

Franco-German War in the Air (Germany)

service. The raider arrived from the westward, dropped several incendiary and explosive bombs, which killed seven and wounded two, and disappeared in the direction of Dunkirk. Dunkirk was raided by a Zeppelin at midnight on February 2, and Nancy shortly after 1 A.M. on April 12; in the latter case about £4,000 worth of damage was caused by the Zeppelin bombs.

The Big Raid on Calais

The big raid on Calais—the largest yet attempted in the war—occurred on May 17. It was shortly after midnight when three Zeppelins flew over the town on three separate occasions. On Calais itself few bombs were dropped. Most of them fell on the villages near by. The first raid took place at about 12.30 A.M., when the whole town was suddenly awakened by a violent ringing of the tocsin and the terrific reports of heavy gunfire. Almost simultaneously bomb explosions could be heard. The sky presented a wonderful spectacle. Half a dozen powerful searchlights were working, and shells were continually bursting in mid-air with a dull roar. The airship hovered over the town until about ten minutes past one, when it was eventually driven off by the guns of the forts.

About half an hour later a second alarm was sounded. The three Zeppelins came this time from Grisnez, and followed the railway line between Boulogne and Calais. At the time a passenger train was going through a station. The airships dropped several incendiary bombs and flares round the train, but none reached their mark.

At 3.30 A.M. a third alarm was raised, and the air duel again commenced. Bombs were dropped by a Zeppelin a couple of miles west of Calais on the coast.

For the moment the Zeppelin seemed to be justifying itself. The builders were encouraged to fresh efforts and the populace to fresh demands. Here we will leave them until in the proper place in this history we again take up their story.

CHAPTER XIII

THE ANGLO-RUSSO-GERMAN AIR WAR

The Story of the Russian Air Service—"Ilya Mourametz"—Russia's Desperate Fight for the Air—The Reason of the Russian Aerial Downfall—Summer's Campaign with the R.F.C.—The Glorious Vindication of Second Battle of Ypres—Development of Aerial Combat—The Genius Battle Airman—Reconnaissance over the Enemy Back Areas—British Aircraft in the Allied Offensive on the Western Front.

THE story of the Russian air service in the Great War is almost—not quite—as romantic and amazing as that of the rise and fall of the Holy Russian Empire. Temperament, the nature of events, geographical conditions; one and all lent added interest and reflected an added romance to the drama of the skies. And the country in which the Russian armies now lay—Poland—offered in the dry late spring and the summer the finest natural flying ground in the world. From Warsaw, as one looks towards the north, an undulating, unbroken plateau stretches roughly 150 miles to the shores of the Baltic Sea. West lie hundreds of square miles of the low arable lands of West Prussia, Posen, and Silesia. The Borisov Hills to the east are distant geographically over 300 miles from Warsaw. And only to the south, the Lysa Gora Mountains, an outlying spur of the Carpathians, offer any danger to the battle airman. Blessed by nature with every advantage, only man has failed to develop. The civilisation of Poland is of perhaps a lower standard than that of any other country in Europe. Factories for the manufacture of highly essential war materials are woefully lacking. The rough, uneven mud tracks, that link together city, town, and village, are not worthy of the name of roads—not even second-class roads. Railways are few and far between; only the Warsaw-Grodno, Warsaw-Pinsk to the east, and the Warsaw-Czenstochow tracks to the west are available. Under these cir-

The Anglo-Russo-German Air War

cumstances it is not surprising to find that the air, offering as it did the only means of rapid and useful transportation, achieved a far greater degree of importance in the east than in the west.

The romance of aviation was shared alike by man and machine. True to locality and temperament, the former varied from almost absurd extremes. From the Russian commander of a trench at Zyrardow, in Poland, who declared to a British newspaper correspondent in all sincerity that "The German aeroplanes employed over the Russian lines were all able to halt or hover in the air above one spot, slowly sinking the while, and then rising again and flying on. This manœuvre served admirably to direct the fire of the German guns," the individual narrative varies to that of a correspondent of the *Vossische Zeitung*, who contributes the following epic on August 20, 1915, describing the manner in which the Russians were burning everything in their retreat (!):

"When I drove beyond Vladimir Volynski, Verba was already burning, and in the immediate neighbourhood I could see no fewer than seven further conflagrations. Our airmen informed me that a great and devouring fire was spreading ever farther in the direction of Kovel."

Taking Warsaw from the Air

It was popularly reported that the German Emperor had said that, if the town of Warsaw could not be taken from the land, it must be taken from the air. The incessant appearance of German aeroplanes hovering overhead seemed to confirm this, but the inhabitants soon became more or less indifferent to them.

The personal narrative reaches a climax with the adventures of a well-known Russian scientist, who carried out some really wonderful feats as an air-scout.

On the morning of July 20, a German aeroplane, apparently by mistake, descended behind the Russian lines, and the pilot and observer were promptly taken prisoners, much to their chagrin. Their machine was in perfect order, and the Russian professor, who happened to be in the locality at the time, immediately saw his chance; together with a pilot he immediately clambered into the fuselage. They rose as rapidly as

The Great War in the Air

possible in order to escape any firing from their own side, and made for the German lines. Having flown at first at a considerable height, they descended to a good reconnaissance altitude, and thoroughly examined everything visible, making notes and plans at leisure. All went well until they found themselves approaching what was evidently the headquarters of the German aviation section, where they could see preparations being made for their reception with supposed valuable information about the Russian dispositions. There was an extremely awkward moment when over the aerodrome, they were flying so low, and the German officers were not slow to note the curious movements of the supposed German plane, whose duty it was to land swiftly and expedite its report to headquarters. When it became plain that this German machine had no intention of landing and looked as if it were trying to edge upwards and away, the Germans suspected a trick, and communicated with the guns. The Russians had quite an exciting time, but eventually got back safely with a mass of priceless information.

It was this same adventurous professor who is popularly accredited with having developed and originated the Russian giant aeroplane, the "Ilya Mourametz." Generally known as the "Dreadnought," this machine was a larger variation of the Sikorsky type, with greater climbing and duration powers. The first action in which one of these craft distinguished itself occurred a couple of months previous to their inventor's escapade over the German lines. A Russian Sikorsky had been out scouting when three German aviators attacked the machine from above, below, and from one side. Some accident prevented the Russian plane bringing its full armoury to bear, but one of the German machines approaching too near was so badly damaged by the Russian fire that it fell headlong. The Sikorsky had one of its engines and a propeller put out of action, besides receiving no fewer than sixteen holes in its benzine tanks. Considerable damage was also done to the struts. The pilot of the plane was twice wounded, and one of the crew had both hands frozen in endeavouring to stop the leaks in the benzine tanks at the great height at which this aerial battle was fought. The Russian plane, when attacked, was over two miles above

The Anglo-Russo-German Air War

the ground, an altitude at which the summer weather, even so far south as the neighbourhood of Krasnostav, where this occurred, had no effect on the temperature, and the cold was increased by dealing with evaporating benzine. The Russian plane reached its own aerodrome again in spite of its serious mishaps, which would have destroyed twice over any other form of heavier-than-air machine yet known.

Ammunition Carrying by Plane

Again, during the masterly retirement of the Russian Twenty-ninth Division under General Bulgakoff, when surrounded by the German armies during the first week in March, the two regiments in this division, which broke through the cordon of Germans, were materially aided by aviators, flying Ilya Mourametz, who continued dropping letters with valuable information, and when ammunition began to fail actually brought a considerable quantity from the distant rear. The zinc-lined boxes of rifle cartridges were enveloped in bales of rags and dropped within reach of the retreating regiments. Several minor, but invaluable operations, in which the Dreadnoughts figured, were the disastrous raid on the night of April 20 on Soldau station, followed four days later by the Ilya Mourametz squadron's expedition on the station of Neidenburg, where their bombs caused a number of fires and destroyed part of the railway line. On April 25 a German aerodrome at Sanniki was annihilated in the same fashion, while during the attack on Neidenburg, ten bombs of a total weight of 1,800 lb. were dropped. One single bomb weighed as much as 180 lb. Among the targets actually struck were the railway station, the track near it, and a large public building. As a reprisal for this raid, the Germans (April 28) sent a Zeppelin as far as Bielostok, the junction of five main lines. The airship dropped several bombs upon the town without causing any losses. The German aeroplanes, at the same time, visited Warsaw, and were murderously busy, killing several civilians.

The Germans were no less active on this front than against the French and British. Indeed, they seem to have had some unusually capable pilots working on the Russian front in the spring of 1915. Compared with Russian airmen, though they

The Great War in the Air

lacked somewhat of their dash and daring, the Germans were better organised and disciplined, and, what was even more valuable, they had had some considerable experience in formation work—flying and attacking in squadrons instead of the earlier and popular Russian method of attacking single-handed. They were particularly active in the region of Ostrolenko, Novgorod, and Czekhanoff, where were situated the main Russian bases and headquarters. The latter made persistent efforts to keep the enemy at bay, but found the single-handed efforts of their aviators of no avail against the enemy squadrons of twelve to fifteen machines apiece. While the Germans flew over many strategical positions, dropping as many as 180 bombs on any town or village which they chanced to attack, the Russians endeavoured in vain to fight them in groups of two and three machines alone. And it was this lack of co-operation in the air that, more than any other factor, was to be responsible for the ultimate defeat of the Russian air service.

This inability was particularly noticeable in May against the wedge, driven by sheer weight of metal, into the Austrian territory held by Russia, a wedge that consisted altogether of 180,000 men, with no fewer than 1,000 guns. These were placed on several lines one behind another, the field artillery foremost and the heaviest guns farthest back. The fire was directed and checked by what is described as a host of aeroplanes. These were in the air morning and night observing and correcting the gunners' aim. One day the Russians brought down four of these German aircraft, yet this did not appear to diminish either the number or daring of their enterprise. Przemyśl was often bombed by German aeroplanes, and innumerable raids were carried out on Warsaw, where, strangely enough, for the first and only time one of the German forecasts of events proved correct. This occurred with messages dropped from the air (July 4), which informed the inhabitants of Warsaw that the town would be in the possession of the Germans within a month.

A Brilliant Russian Exploit

Immediately afterwards, July 9, occurred the most brilliant Russian aerial exploit of the campaign. An Ilya Mourametz

The Anglo-Russo-German Air War

made a four-hour flight over the district of the River San, during which it dropped three bombs into the enemy's transport at Lezaïsk and eight on the station at Przevorsk. Over the latter town the machine remained for fifteen minutes, and described four circles.

The bombs dropped were each 180 lb. in weight. In the station stood five heavy trains, one of which was struck and set on fire. The flames spread very rapidly, and before the aeroplane left an area of several square versts was enveloped in clouds of smoke. It was admitted by the German Press afterwards that a bomb struck a trainload of artillery ammunition, and at least 30,000 charges were destroyed.

In addition, railway communication in the enemy's rear was seriously disorganised for a considerable time. The machine was in charge of Lieutenant Bashko, who had with him Lieutenant Smienoff, Artillery Captain Naumoff, and Mechanic Shkudoff. The Russians now claimed that greater accuracy of aim in bomb-dropping could be obtained from the Ilya Mourametz than from any other type of machine.

Again, according to a note semi-officially issued in Petrograd on July 30: "Two Russian aviators, Lieutenant Pokrovsky and Cornet Plovsky, spotted an Austrian aeroplane flying a long way off towards 8 A.M. on July 28. They immediately flew towards the Austrian, and climbing above him, opened fire with their rifles, forcing him lower and lower towards the ground. All attempts on the part of the enemy's machine to defend itself proved unavailing, and after a short fusilade the Austrian aviators came to earth.

"The Russian aeroplane landed by the side of the Austrian, and the two Russian officers instantly rushed at the Austrians with their rifles. The enemy's machine was carrying a lieutenant and a non-commissioned officer, and these surrendered on the spot. The captured machine was an absolutely new Aviatik, with an engine of 120 h.p."

With the exception of a few unimportant events of this nature, as the bringing down of a Zeppelin near Vilna, which had on board an officer, an engineer, eight soldiers, photographic apparatus, a small machine gun, and ten explosive and a quantity of incendiary bullets and bombs, and the Russian

The Great War in the Air

aeroplane that dropped bombs on Czernowitz on the celebration of the Austrian Emperor's birthday, no other occurrence is worthy of record. And it is with the utmost reluctance that one must admit the very real failure of our one time Ally to justify the splendid organisation and personnel with which she entered the war. Undoubtedly leading the way of all the belligerents in aircraft construction, with the Sikorsky and the Ilya Mourametz, Russia achieved a very early and perfect type of the large aeroplane of later war days. The capabilities and courage of her airmen were beyond all question. Yet Russia failed in the air, and she failed solely through lack of co-operation.

R.F.C.—1915 Summer Campaign

The second Battle of Ypres may be said to have been the birthplace of the modern British R.A.F. Battered, mutilated, worn and weary, the remnants of a tiny flying corps hovered pluckily behind the British lines on that memorable day of April, 1915. It was a corps but in name. The finest manhood of young Britain, numbered among the ranks of pilots and observers, had been sacrificed to that incessantly heavy death-roll of the war in the air. The reserves, such as there were, were men with little experience of flying, rather less of military aviation. Last of all the belligerents in the matter of aircraft construction, the British planes were woefully out of date compared with the latest developed German types. And they were all of them battered and worn by constant usage and merciless handling from the attentions of the enemy anti-aircraft gunners. Even satisfactory bases were lacking; such as there were were ill-equipped. Small wonder then that, even in high military circles, the R.F.C. was still regarded somewhat askance as a battle unit. For all that they were flung into that decisive battle that raged for three long and bloody weeks around the now smouldering ruins of Ypres. When the battle was over it was found that the tiny handful of pilots and observers had revolutionised every theory of military attack and defence.

The second day of the battle—April 24—a British reconnaissance pilot saved the British Army from annihilation; the Allies from being driven back irretrievably into the sea. This

The Anglo-Russo-German Air War

flying officer—then a captain, and now, such was the rapid promotion in the Royal Air Force, a general—was doing a reconnaissance on a Bleriot machine when he observed the gigantic concentration of German troops on the flank. He brought back the information—only to hear it voted unbelievable and incredulous. The pilot was so insistent, however, that the army chiefs sent out fresh aeroplanes to confirm or deny his report. All these returned with the assurance that the news was undoubtedly correct. "The work performed by the Royal Flying Corps has been invaluable," reports Sir Herbert Plumer in his summary of the battle. "Apart from the hostile aeroplanes actually destroyed, our airmen have prevented a great deal of aerial reconnaissance by the enemy, and have registered a large number of targets for our artillery." And the British Commander-in-Chief adds as a footnote to their work in the great battle: "The Royal Flying Corps is becoming more and more an indispensable factor in combined operations. In co-operation with the artillery, in particular, there has been continuous improvement both in the methods and the technical material employed. The ingenuity and technical skill displayed by the officers of the Royal Flying Corps in effecting this improvement has been most marked."

In a single month the Flying Corps achieved a fame on a par with the best traditions of the century-old history of the average county regiment. They were regarded by all ranks of the infantry with unbounded respect and admiration. It was the most curious situation. The foot-soldier, hourly encountering untold dangers from German shells and poisonous gases, frankly avowed no envy of the flying man in his "dangerous" pursuit; while to the aviator any expedition in the air, however daring, was infinitely preferable to the "dangers" of the trenches. However, this was before the days of "joy rides" for artillery and infantry officers to study the country which lay before the British lines. Even then this enthusiasm for the airmen in no way diminished; for it was recognised by these capable soldiers that, where it is one thing for a man, fortified by the moral support of companions on all sides and in the heat of the battle, to charge on the enemy trenches, this business of flying over the lines, the legitimate target of every enemy

The Great War in the Air

gun for miles around, savoured rather too much of splendid isolation and cold-blooded effort. As flying developed this admiration grew apace. The mere presence of a flying man overhead appeared to stimulate the British infantry to further effort; contrariwise, immediately the enemy aircraft came flying over his trenches and lines the general depression was most apparent.

"Hand to Hand" in the Air

An aerial battle provided the one relaxation of the grim-fought hours of daylight. As though by common instinct, every activity in and behind the British and German trenches ceased immediately. The battling planes, remorselessly continuing the eternal struggle of mankind in this latest battlefield of the clouds, held a romantic spell and magnetic attraction that none could resist. From corps commander to the latest-joined recruit every unit of the British Army just craned its neck and looked and longed. Certainly it was a sight for the gods. Diving, twisting, climbing, those two tiny, seemingly helpless atoms of humanity, silhouetted against the boundless expanse of blue sky, for one breathless second seemed to hold the pulse of the whole battle in check. Then, as one or other of those lithe forms fell headlong from the fight, straining eyes would snatch at the markings of the wings and fuselage. Should it prove to be the deep black crosses of the enemy that were undermost the British lines went mad with delight; but at sight of the red, white and blue rings a mournful echo would sweep along the lines like the moan of the autumn wind through the trees.

The most significant event on the Western Front during the summer of 1915 was the development of aerial combat. Quite early in the war British airmen had established over the enemy an ascendancy that was obvious to friend and foe alike. In the latter months of the winter and the early months of spring there was a notable deficiency of German airmen, till the appearance of a Taube became quite an event at any considerable distance from its own guns. Raids were made indeed, but they were always of a furtive character, and the determination to avoid combat was convincingly evident. The

The Anglo-Russo-German Air War

unfavourable weather conditions of June forbade any great extent of aerial operations.

During that period, however, with great foresight both British and German High Commands expedited construction and training of personnel beyond all previous imagination. The new men, daily gaining a more practical insight into military aviation, were sent out at every opportunity to practise reconnaissance, the direction of artillery fire, and ultimately aerial combat over the lines. Spare machines, however, were not too numerous at the time. All the best were required for the actual combatant work. The probationers had to take their chance with the older craft. Shyly peering over the battle front from a distance, circling round the back areas in the cold grey dawn or the late twilight, occasionally a German machine would sneak across the lines. The old-time aeroplane would be hopelessly outclassed by the more modern and powerful Taube. The inevitable end would be a charred, unrecognisable heap of shattered material lying in a forlorn corner of some quiet field; but the enthusiasm of the survivors never slackened. And as the new men progressed their eager wish to participate in combatant service was speedily granted. The R.F.C. went into the 1915 summer campaign some fifty per cent. stronger in personnel than that which had brought to a close the autumn of the previous year.

The Germans Beaten—For the Time

Their glorious vindication at Ypres now enabled the flying commanders to obtain all the necessary financial grants and constructional facilities in the home country. Resultingly the output of machines went up with a bound. And these new machines, in their turn, were not without their effect on the work of the battle pilots in the air over the enemy lines. Photography now became possible from an altitude of well under 6,000 feet. The wireless, considerably developed in the winter months, was now practicable over a distance of thirty to forty miles. Greater duration powers enabled our machines to penetrate far deeper into the enemy's country.

British machines were brought down by anti-aircraft fire, by mishap, and by engine failure, but never once by the

The Great War in the Air

superiority of the German airmen. Time after time the British had chased the Germans back to their own lines, or driven them from the air, till the enemy aviators were forced ever higher and higher for safety, and it became the expected procedure for an enemy aeroplane to show its tail whenever British aircraft hove in sight.

The Germans, however, were not the people to allow this condition of affairs to continue for ever. They also, during those winter months, had been busy in developing new craft. And when these made their appearance on the Western Front our men were for a time hard put to it to maintain their superiority. And aerial duels became a thing of more than daily occurrence.

During the period April 15 to June 15 no less than sixty encounters took place between British and German aviators, in which not one of our machines was lost. As these fights, however, occurred invariably over or behind the German lines—according to Boelke, the first German “ace,” it was the policy of the enemy air service to get British machines over their lines whenever possible; for as he himself once naively pointed out to an inquiring Prussian journalist: “Why should we make a present of our new machines to the enemy?”—only one hostile aeroplane was brought down in our territory. Five more, however, were definitely wrecked behind their own lines, and many were chased down and forced to land in most unsuitable ground. Through the midsummer the aerial duel somewhat slackened off, but September proved a tremendously heavy month in the air. Some ten further enemy machines were brought down before September 1, and during the following twenty days no less than forty battles in the air took place. Here is the official record of encounters :

<i>Date</i>	<i>Number of Encounters</i>						
1st	...	...	...	...	...	...	2
4th	...	...	...	...	...	...	1
5th	...	...	...	...	...	...	9
6th	...	...	...	...	...	...	2
7th	...	...	...	...	...	...	5
8th	...	...	...	...	...	...	2

The Anglo-Russo-German Air War

<i>Date</i>								<i>Number of Encounters</i>	
9th	...	...	...	...	...	...	...	1	
10th	...	...	...	...	...	...	...	5	
11th	...	...	...	...	...	...	...	1	
12th	...	...	...	...	...	...	...	5	
13th	...	...	...	...	...	...	...	4	
14th	...	...	...	...	...	...	...	1	
18th	...	...	...	...	...	...	...	2	

These occurred all during the so-called "quiet" days along the British front. During this period of eighteen days, miles across in the enemy's country, far beyond the stagnant trenches, at least four German machines were destroyed, seven others were driven down helplessly to earth, and all the survivors chased ignominiously into their own country. In one instance a youthful British airman single-handed brought down and destroyed six enemy machines, two of them in a single day. Later in the month he fought five Germans in one morning. The first was a furious battle. He beat off the leading four German machines which came up to grapple with him one after the other, but when the fifth bore down on him he had exhausted all his machine-gun ammunition. Instead of retreating to safety he boldly turned and dived to meet the enemy, with his hand to his empty machine-gun as though ready for action. Fortunately the German pilot, who saw him go through these evolutions of aiming and firing, did not realise—the noise of the engine dulled the report of a shot—that the weapon was useless. The enemy fired twenty or thirty rounds and then gave it up, while our man finished his flight in peace and came back to lunch.

Throughout the war it was the rule, and a wise rule, of the R.F.C. never to mention names, except through the official channels of the awards list of the *London Gazette*, so this daring pilot's name cannot be recorded, though no doubt he found ample gratification for his happy morning's work in the congratulations of his fellow pilots. A yet greater return for his services, and a great compliment to the whole corps, was the personal visit of Lord Kitchener, who was accompanied by Mr. Asquith, to the headquarters of the R.F.C. on July 6.

The Great War in the Air

It was a disagreeable day, as a high wind was blowing and clouds of dust hid the earth and rose in great clouds from every patch of bare ground. But though flying was impossible, the War Minister's party spent a highly interesting couple of hours in the workshops and hangars outside St. Omer, and many of the airmen were introduced personally to Lord Kitchener. But perhaps the finest reward of all to these unknown "aces" was the knowledge, growing stronger every day, that their single-handed efforts were making possible an unprecedented series of reconnaissance flights over the enemy's country, and thus materially assisting the general scheme of campaign.

The Reason for Air Fighting

The aerial fighter, as will be shown in a later chapter, paved the way for every activity in the air. It was, for instance, highly necessary that the speedy German Taubes should be driven from the air before the slower British observation planes could get to work in that same area. And the services of an artillery directing machine would prove little better than useless if the pilot was constantly harassed by roaming enemy aviators. It might be said further that the battle pilot was the key to the situation of that mythical condition, the "mastery of the air." Meanwhile in those new and more extended reconnaissance flights British airmen were evincing great ingenuity as well as greater daring.

It was mainly with their assistance that Sir John French was able to carry through his brilliant retirement of May 2. Reconnaissance pilots had already proved of great assistance to the French, April 22, in warning them of the approach of German asphyxiating gases. Aircraft reported that at about 5 P.M. of that day thick yellow smoke had been seen issuing from the German trenches between Langemarck and Bixschoote. In the retirement of May 2 the aeroplanes still hovered over the area of the lately deserted British trenches, making the enemy believe them to be still occupied. And from that date until May 4 the Germans indulged in a heavy bombardment of these positions, thus materially assisting the British infantry while digging themselves into new trenches. So soon as the

The Anglo-Russo-German Air War

retirement was discovered the Germans commenced to entrench opposite our new line and to advance their guns to new positions. Here again, however, the aircraft considerably hampered their advance by their accurate direction of the British artillery on to the new enemy positions, causing him considerable loss in carrying out these operations. Needless to add, the enemy loved our flying men no more for thus cleverly baffling them.

They were still further enraged by a custom which first developed with British pilots in early July. For certain reasons the officers of the Royal Flying Corps on aerial reconnaissance or observation duty sent back messages by means of light signals. The enemy determined to put a stop to this. And, exploiting the fact that it is sometimes very difficult for those below to recognise whether an aeroplane at a high altitude is friend or foe, immediately these light signals were fired off the Germans commenced to open fire on areas or targets in our lines which had already been carefully registered. The object of this procedure was by the sequence of the fire of their guns after the exhibition of lights from a British aeroplane to make those in charge of our anti-aircraft armament imagine that the aeroplane they saw was a hostile machine observing for the German artillery and to shell it.

Well thought out as was the ruse, it had only to be seen through once to be rendered innocuous; but the underlying intention of employing our own guns to destroy our own planes was distinctly deserving. But observation, in which these signal flares were employed, was but a particle of the reconnaissance work carried out.

Bombing the Railways

The Germans were again endeavouring to concentrate large reserves on the Belgian front. To prevent this threatening operation the British High Command were straining every nerve. The strain and fatigue of the second battle of Ypres was yet too present, and the aerial campaign to prevent the possibility of a repetition was very thorough. For the most part it consisted of bombing raids on the enemy's bases and lines of communication.

The Great War in the Air

In the German back areas Ghent was raided by pilots of the R.F.C. on June 17. Though the majority of the bombs were dropped on the Zeppelin shed, considerable damage was done to a squadron of enemy aeroplanes housed in some neighbouring hangars. The strategic value of this raid was enormous, for at that particular moment the Germans required the services of every possible machine that they could muster, and here was an entire squadron put out of action in one night. At Roulers on July 2 two ammunition trains and a storehouse for shells were blown up. These troop and ammunition trains were constantly being bombed, causing great confusion with regard to the enemy's reserves, which objective, it will be seen, was the most important of the Allied early autumn campaign. On August 25, wholly directed from the air, the British artillery set fire to a railway train at Langemarck station, and destroyed a long stretch of track that took the enemy three valuable weeks to make good. The same night an aerial attack was made on the Forest of Houthulst, where the Germans had accumulated a great quantity of artillery and reserve ammunition. Again their threatened offensive was postponed for a couple of weeks, and contrariwise another step had been gained in the Allies' plan of campaign.

By the end of September the aerial offensive was well advanced, and still the enemy were prevented from attacking. Valenciennes, probably the railway junction of greatest strategic value to the Germans at this time, was raided on September 24. Havoc was played with the German communications, and a railway train was hit and the line cut in several places. Two days later our aeroplanes bombed and derailed a train near Loffres, east of Douai, and another which was full of troops at Rosult, near St. Armand; and Valenciennes station was again bombarded. On September 28, 1915, the railway line near Bapaume was bombed and severely damaged, wrecking a train, and the railway near Achiet-le-Grand suffered the same fate. On October 1 Sir John French reports: "Attacks have been made on the railways in the hostile area. The main lines are known to have been damaged in fifteen different places. Five, and probably six, trains were partially wrecked, and the locomotive sheds at Valenciennes were set on fire. Considerable

The Anglo-Russo-German Air War

interference has thus been caused to the German railway organisation."

Here, the more clearly to point out the significance of this continuous British aerial offensive, a brief study of the dispositions of the belligerent forces will be found of great value. August—for that matter the whole of the two previous months—had found a period of unusual stagnation along the Western Front. It was, however, but the lull before the storm. Both belligerent High Commands were making strenuous preparations for a grand coup; the objective in both cases differed as widely as is possible in war. Where the German cherished the idea that, by means of a great and decisive battle, they would be in Paris before the second "fall of the autumn leaves," the Allies were equally determined, immediately by the same means, to drive the German back within his own frontiers. How both sides were to fail in their main object is now a matter of history. However, both British and German Staffs—the former probably more than the latter—realised the value of the air in this matter.

The Allies possibly were numerically superior. Roughly speaking, to the 3,000,000 French and British troops—Sir John French had under his command by this time a force of a million men, or 600,000 bayonets—the Germans mustered only two millions, or something like 1,500,000 bayonets to hold a front of over 570 miles. This force at first sight must appear totally inadequate for the task in hand. But meanwhile the enemy had developed all down his lines, from the sea to the Alps, an intensive series of light railways, by which it was possible in a remarkably short space of time to greatly reinforce any given point. It was the object of the French and British—particularly the British—flying services to dislocate this system of light railways as far as was humanly possible.

How well they had succeeded, thus far, in this object may be judged from the events already narrated in this chapter. While regarding their ultimate success, a further reference to Sir John French's order of the day of October 4, commenting on the work of the British aircraft in the Allied offensive of September 25, 1915, is necessary.

"The Field-Marshal Commanding-in-Chief," states this

The Great War in the Air

order, "desires especially to thank pilots and observers for their plucky work in co-operation with the artillery in photography, and the bomb attacks on the enemy's railways, which were of great value in interrupting his communications.

"Throughout these operations the Royal Flying Corps have gallantly maintained the splendid record they have achieved since the commencement of the campaign.

"He desires to express to Brigadier-General H. M. Trenchard, C.B., D.S.O., A.D.C., and to all ranks of the Royal Flying Corps, his appreciation of the valuable work they have performed during the whole of the battle which commenced on September 25. He recognises the extremely adverse weather conditions, which entailed flying under heavy fire at very low altitudes."

CHAPTER XIV

THE DAY'S WORK

The Airman's Day—Over the Battle Lines—Frozen in Mid-Air—Daring Feats of British Reconnaissance Airmen—Field-Marshal French's Glowing Praise of the R.F.C.—The Renewed Struggle for the Air—British Aviation Casualties—Captain Robert Loraine's Military Cross—The Sunset Return.

THE natural—and what more natural—analogy to the aviator is the bird. Alike in habit and intention, there is an almost uncanny similarity between the very young daring airman and the very wise old feathered denizen of the skies. Quite early in the war the enemy made a remarkable discovery with regard to aviation. It more than generously supports our analogy, and it was the fact that the man-built aeroplane, which most closely resembled the lines of a bird, was not only more airworthy but considerably more speedy and responsive to manipulation. With each successive type of German machine this likeness developed, until with the Albatross it was almost possible to imagine some mammoth, inhuman seagull hovering overhead.

Then some flying commander or other initiated the V-shaped formation. It was old—old as the hills of Galilee. For there, hundreds of years B.C., the wild geese went screeching overhead, twice a year at their annual migration—in V-shaped formation! The very brain, habit and general appearance of the twentieth-century airman smacks of the hereditary. The live, searching eye, the all-seeing glance of the eagle, the vulture, and the hunting cormorant, somehow found its place in the physiognomy of the reconnaissance pilot and observer, and the same marvellously quick intelligence. With all the fury of a fighting-cock the airman, in the heat of the battle, more by instinct than experience, would hurl himself at the back of the neck of his antagonist—his "blind spot." And the bird habit

The Great War in the Air

of dawn and sunset activity, with its midday comparative quiet, early became the fashion of the war in the air.

The airman's day was quite a feature to itself. Long before the slumbering infantry began to stir in their muddy trenches, and the great guns roared out in their morning salutation—this was in the early days before the twenty-four hours of incessant horror of the later battles—the airman was already busily at work, hovering overhead, far across the enemy trenches. Perhaps not the pleasantest hour of the day for flying, it was a time of mixed emotions.

The courage of the average man is never at its highest at the dawn. Add to that the known dangers of flying and the reception constantly awaiting the aviator on the enemy's side of the line. His anti-aircraft gunners never appeared to sleep. Add to that again the numb feeling of the brain immediately after waking and the cold chilling "bite" of the early morning breeze; dawn patrols were not exactly popular. But, once up in the air, a man's feelings immediately underwent a change. The joy and exhilaration of flying are never keener than when breathing that early morning freshness of the air, that is like champagne to the senses. Below, a glorious, living panorama; the earth is awakening to the new day. Far, far on either side, faintly discernible through the grey mists, can be traced the irregular outlines of roads, rivers and railways. Puffing up towards the front line is a rumbling troop-train, the smoke of its locomotive easily distinguishable against the grey surface. The roads are already alive with traffic that can be discovered in tiny miniature, blobs and points of moving grey, with the faint winding wee ribbons of blue of a river here and there apparent. And so to the lines.

Far above the serried lines of the opposing trenches the British plane would sweep into view. As though by magic the anti-aircraft artillery would yelp into action behind the enemy lines. The fair blue face of the sky would be smudged with pockets of yellow and flame—the bursts of the "Archies" all round the hurrying machine. And the pilot himself, strung up there an involuntary target between heaven and earth, would not be feeling quite at his best for a reception of this nature. Then the weather might prove to be unfavourable. A strong

The Day's Work

head-wind might be blowing constantly against him. His speed would slacken accordingly. And the more it slackened the more accurate grew the fire of the enemy guns. Again he might be driving on through rain and cloud—that tossed his machine about like a ship in a stormy sea—or cautiously feeling his way through a dense fog, the most dangerous element of all. The airman, much envied by his unfortunate and muddy brother of the trenches for his comfortable quarters and reasonable life, had to pay for these luxuries with moments of heart-stopping danger and terrifying sensations and emotions. The machine might be giving undue trouble, and the pilot himself be faced with unpleasant anticipations of having to land within the German country.

"I was flying a rotten old machine," says one of these early pilots, describing a flight of just such a nature, "with an engine that ran very badly and was missing from the time I left the ground. Under ordinary circumstances I should have landed, but it was an important reconnaissance, so I had to do it. The highest I could get the machine to was 4,700 feet, and then as I flew towards the lines I could see our other machines up getting a hot time from 'Archie.' They were flying between 7,000 and 8,000 feet, and as soon as I was within range the Germans opened on my machine; and then, during the whole of the reconnaissance, which consisted of circling about a small area, they didn't give me a moment's peace. I had shells bursting around my machine the whole time; simultaneously flashes of flame and loud bangs, sometimes on one side and sometimes on the other, below the machine, above it, behind and in front, and some of them bumped the machine about unpleasantly. It was thoroughly uncomfortable. I twisted the machine about this way and that, made sideslips outwards, and did everything I could to spoil their aim, but they kept me guessing the whole time. One shell exploded just in front, and I saw some bits of things flying off the engine and thought the propeller was gone. I was very glad when the reconnaissance was over. On landing I found that the machine had been hit by rifle fire as well as by shrapnel. . . . Yesterday I was up for over an hour trying to get a reconnaissance, but there was mist from 400 feet up, and from 3,000 feet thick

The Great War in the Air

clouds, in which I was awfully knocked about by bumps. After flying for some time at a bit under 5,000 feet I thought I was behind our lines, and shut off the engine and glided down to 3,000 feet; and, when I could see the ground, found I was well behind the German lines. They must have laughed when they saw the machine unsuspectingly appearing out of the clouds, and they greeted me with a tremendous fusillade of rifle-fire and some 'Archies' that didn't, however, come very near. I got into the clouds again as soon as I could, but had a warm time in doing it. They succeeded in hitting the machine only once or twice."

A remarkably trying experience befell a flight-commander of the present writer's own squadron. "Yesterday," he wrote in a letter home to his parents, "I had my first really trying experience. We did a long reconnaissance which took us nearly to Mons, taking us four hours and five minutes. When we left the ground it was freezing hard, and *en route* we encountered two snowstorms. The cold was absolutely excruciating, my eyes got frozen up; it sounds absurd, I know"—it was a fact—"but the water in my eyes turned to ice. I had to keep on brushing it out of my eyes. A great sheet of ice formed over the mouth of my mask, so that I had to smash it to breathe. We finished off by fighting a German machine and chasing it from Arras to Douai, where he dived down under cover of his Archies and Horaces. We arrived back, and the pilot, being nearly dead with cold, crashed the machine on landing. Fortunately neither of us was damaged. When we got in we found that they were just preparing to pack our kits, as they thought that we must have been brought down in Germany. I have added one of the propeller blades of the crashed reconnaissance machine to my collection.

"Sunday night.

"What a day! I was just getting up at 9 A.M., having had a lazy morning, when a message came down from the office to say that two Huns were on their way to ——. I ordered out one of my machines—the one I always go with—and we left the ground to cut them off. When we were over B——, well in our lines, at about 5,000, we spotted a Hun at about 11,000. We chased it, climbing all the time till, when just near Lille,

The Day's Work

or about ten miles into the German lines, we got level with it. By this time the German (an Albatross) had been joined by two other Huns. We swept past the Albatross (a big white machine), and I got forty rounds into it at close range; he banked, then rose, dived to earth and crashed, apparently turning over. By now the other two machines had turned to engage us, and on turning we found two more coming from over Lille. Four to one—good odds. Fairly long odds; but still we thought we'd have a good smack at it. Rather to our annoyance we saw what we took to be a sixth German—a tiny little single-seater. On they came; they came in line, sweeping past us on the left, round behind our tail, and back on the right. To our surprise the little tiny machine fastened on to the tail of one of the Boches and chased it round and round, and proved to be a little Morane scout. They came on time and time again, pouring machine-gun fire on us, but for every shot we got they got one back; but at one time we were getting the fire of four machines at once. My hands began to lose all feeling, but I kept the gun going. Bang! bang! came their shots; we could feel the little jars as our machine was hit. But apparently they got more than they gave, as after twenty-five minutes' fighting two machines cleared off towards Lille and the other two, not liking to be left to fight two British machines (although one was only a little single-seater), flew off southwards. The scout and we at once gave chase to one of them, but had to give up the chase 20 miles farther south, and gracefully retired to our own lines to the accompaniment of much Archy."

In these few instances a very fair idea may be obtained of the nature of the work carried out by British airmen in the early morning hours over the battle lines. Reconnaissance and bombing raids were their chief activities. To an appreciable extent the former had begun to influence the main battle. Ignorance of an enemy's movements was now a thing of the past. Both Commands were kept informed of every event that took place within ten miles of the opposing front hour by hour. Surprise was impossible. However, brilliant as had been the work of the British observers, the enemy was also well served by his innumerable reconnaissance machines. We had the

The Great War in the Air

better of the incessant duel in the air only in one respect. At the outbreak of the war there were sufficient keen military airmen and efficient amateurs to form the nucleus of a great corps. During the winter months these few had, with extraordinary rapidity, initiated in the art of war flying a large body of young enthusiasts. And they in their turn had coached the hundreds and thousands that followed.

The Autumn of 1915

The fruits of their labours were soon to be apparent. In the Allied offensive, which began on September 25, no fewer than nine reconnaissance airmen were awarded decorations for their work in the battle. To points sixty miles within the German lines Captain Lawrence fought his way, despite the repeated attacks on the part of an enemy machine. On September 25, descending to 600 feet, he bombed a moving train near Lille. The following day he drove off a hostile machine which was interfering with the British bombing planes. On September 30, although his machine was hit in seventy places by anti-aircraft guns on crossing the German lines, and in bad weather, he carried out a three-hour reconnaissance. In four successive flights Lieutenant Long dropped a 100-lb. bomb on an enemy anti-aircraft battery; made two determined attacks on trains from 500 feet, breaking the rails in two places; and on the afternoon of September 25, having heard that trains were moving at 25 miles' distance, in spite of the darkness and bad weather, volunteered to attack them. Heavy rain hampered him greatly in this daring manœuvre, so he turned to attack Peronne station, descending to 500 feet and coming under heavy anti-aircraft gunfire. This fire prevented his reaching the station, but he climbed to 1,500 feet and attacked a "rocket" battery, silencing one of its guns; while another British airman the same day on the Phalempin-Seclin line bombed a train and damaged the track from a height of 400 feet, under heavy rifle-fire and bad weather conditions. The following day Lieutenant Symington demolished part of a train, which was moving towards St. Amand, by bombs dropped from a height of 500 feet. A large portion of the train was completely wrecked, and he observed dead horses thrown out of it by the

The Day's Work

explosion. The remainder of the train was quite unable to proceed. Accompanied by Lieutenant Vaucour as an observer, Captain Rabagliatti carried out a reconnaissance over Valenciennes and Douai. They had to fly in thick cloud for nearly the whole distance, and several times their machine got into a "spin." The pilot, however, succeeded each time in righting his machine, and they reached their objective and carried out their reconnaissance.

Reconnaissance was by this time usually the forerunner of a bombing expedition. Following three such visits, Miraumont (near Albert), an important German supply depot, was daringly and brilliantly raided. This happened early in September, when the enemy had accumulated at Miraumont a considerable quantity of railway rolling-stock, which was guarded by innumerable trenches, dug at intervals round the station of that town. Trenches, station and rolling-stock alike were blown sky-high by the bombs, and this despite a very high wind and unfavourable weather conditions, against which the British airmen flew daringly on their long outward and homeward flight. Two afternoons later—September 30—nineteen British aeroplanes attacked the railway junction of Don, a strategic point which formerly, frequently and disastrously had been dealt with by Allied airmen, notably during the Neuve Chapelle and Loos operations. The railway station and several adjacent buildings were hit by bombs. The railway track was blown up for some distance. One of the projectiles caused a big explosion in a magazine. This conflagration was visible for miles as, successfully driving off the attack of four hostile aircraft, our men returned to their base.

Raid and Counter-Raid

Often the enemy would retaliate. Six bombs were dropped by a single German aeroplane near Bray on November 26, as a reprisal for the previous day's British raid of twenty-three machines on the hut encampment of Achiet-le-Grand (north-east of Albert), without, fortunately, doing any damage. Sometimes also they would set traps for the British bombing planes. Hovering over the neighbourhood of Albert, hidden by the clouds, on the 27th was a powerful squadron of

The Great War in the Air

eighteen German machines of the latest type, awaiting the return visit of our bombers. They never came. A commander of unusual foresight had sent them early away to the north. Fourteen machines raided the enemy aerodrome at Ghits, and nineteen others an ammunition factory at Lachapelette. Considerable damage was done in both instances. A strong squadron of British fighting planes had also been dispatched to deal with the patrol over Albert. The enemy, in the course of fifteen hard-fought encounters, lost one machine, and one of our pilots fought five hostile aeroplanes during a single flight.

Our New Machines

Four further raids of any importance were carried out by British airmen before the close of the year. Miraumont depot was raided twice again (December 2 and 12). Considerable damage to stores, buildings, and to the railway was accomplished by the first raiding party. Carrying out the attack in a high westerly wind, which made flying difficult, the second bombed a store depot and the neighbouring aerodrome at Hervilly, an objective that was raided again on December 15, and on the 30th of the same month was devastated by an attack of ten British aeroplanes. With the second flew another squadron that bombed Comines station. Both squadrons were heavily attacked by enemy craft on their homeward flight.

A most significant phrase concerning the development of aerial combat occurs in the same dispatch. During these three months, according to Sir John French, no fewer than 240 combats had taken place in the air. In nearly every case British pilots had to seek the enemy behind his own lines, where he was assisted by the fire of his movable anti-aircraft guns, and in spite of this they succeeded in bringing down four of the German machines behind our trenches and at least twelve in the enemy's lines, and many more had been seen to dive to earth in a damaged condition or to have retired from the fight. An almost perfect combination of man and craft allowed our men this undoubted superiority in the most strenuous of all aerial activities—the aerial duel. The newly developed machines of the winter months of 1914-15 seemed to possess greater stability and safety. Their increased climbing powers

The Day's Work

often proved the turning point in a hard-fought encounter. The pilots were themselves fearless of all dangers, and although there was no mercy on either side during these acrid combats, the battle of the air was enlivened by some of those little touches of chivalry and gallant humour which belonged essentially to old-fashioned warfare.

The British pilots appeared to be as much at home in the air as the British sailor on the sea. For instance, while two Fokkers were diving at the back of one of our machines, in a 1,000-foot dive, the British gunner shifted his gun from its position in the front to the rear mounting. Then, after firing half a magazine of bullets, he saw the leading German machine tail-glide for the fraction of a second and then plunge to earth in a vertical nose-dive. Another and even more remarkable instance of such a change-over in the air occurred to two British flying officers on October 26. At 7,000 feet, while engaged in photographing the enemy's back areas, this machine was suddenly attacked by an enemy plane. The observer was immediately wounded in the left arm, and the true danger of their position cannot be imagined. Knowing that the observer would not be able to manipulate his gun, the pilot kept manœuvring to avoid the fire of the enemy's aircraft, but was hit in the arm and shoulder and lost consciousness. The machine rocked and swayed about in a giddy spiral. However, without losing his nerve, the observer ultimately succeeded in returning to the Allies' lines. Seeing the pilot limp and senseless, he climbed over between the two back struts and caught hold of the control lever. He moved this about, but nothing happened. He then tried to close the throttle. This did no good, the wire apparently having been broken. Finally, he turned off the petrol, and, getting the machine under control, managed to land it behind the French reserve trenches.

Some Narrow Shaves

Two other British airmen had a narrow shave at the hands of a huge hostile pusher machine the same day. The pilot had been wounded and the petrol tank pierced. However, another British plane, looming up across the horizon at this fortunate moment, saved the day. With a rapid dive the newcomer put

The Great War in the Air

the enemy to flight, and escorted the crippled machine back to our own lines. Two further British airmen—November 4—solely by superior gunfire, drove off the concerted attack of three enemy planes.

It must be admitted, however, that these were specially favourable instances quoted, while the Germans were at last beginning to make headway in aerial fighting. Frequently now would appear, as a postscript to the British official, the phrase: "One of our aeroplanes failed to return." In the boundless region of the air the tide of battle fluctuated considerably. It was largely a matter of local conditions. With a favourable wind much could be accomplished. But when a strong wind was blowing from the enemy's lines, the dangers to British airmen became manifold. The speed of the machine was reduced in ratio. Slow flying rendered the aeroplane all the better target to the enemy anti-aircraft gunners, the easier prey to their hunting scouts, swooping down with the wind at their backs. Fortunately, however, the wind was a neutral element. And one has only to follow the daily course of the air battle to realise how, and where, conditions varied.

Aircraft in the Battle of Arras

The first week of the October battle of Arras was a remarkable period for British aircraft. With a praiseworthy attempt to regain the mastery of the air which they had lost in the closing stages of Ypres of the previous May, German airmen no longer avoided, but eagerly sought encounters. The British aviators did not disappoint them. Fifteen fights in the air between British and German machines occurred on the Sunday, and four on Tuesday. A single British machine was "taken on" in one of these encounters by four German aeroplanes at the same time, yet managed to beat off his assailants. On the other hand, a German pilot beat off the attack of three of our aircraft by what was, literally, superb airmanship. He appeared to make circles round them, and finally left them somewhat muddled, murderously converging on an empty space in the air, while he was scuttling away merrily over their heads. That pilot was, perhaps, the biggest man of his side at the time. He was no less a person than the celebrated

The Day's Work

Boelcke, the first of the German "aces." It was an exceptional case, for, unused to the initiative for so long, the enemy now paid dearly for his daring. Eleven German aeroplanes fell to the R.F.C. that week.

Up to November 30 the casualties of the R.F.C., in comparison with the great activity of the pilots, were comparatively light. During the six previous months 25 British airmen had been killed, 43 wounded, 10 were missing, and 44 had been taken prisoners by the enemy. In the desperate battles of November and December, however, the number of casualties increased alarmingly. But that was only to be expected. Forty-four air-duels were fought in a single day, on December 19. Two of the enemy's aeroplanes were brought down behind their lines and others were driven down apparently in a damaged condition. Seventeen more of these encounters were fought to a definite finish, ending in every instance in the flight of the enemy plane. The inferiority which such a condition of affairs would suggest does not reveal the enemy in his true colours. He was really a most capable and daring pilot. But he was beaten by the indomitable British spirit of never recognising defeat.

The Germans at a Loss

The German was entirely at a loss when grappling with the psychology of a nation whose airmen could perform such deeds as the following. A British machine—November 16—engaged a German aeroplane at close quarters, and forced it to land heavily in a ploughed field behind the German lines, where the enemy pilot thought he was safe.

Our airman, diving within 500 feet of the ground, opened a heavy fire on the pilot and observer, who had left the aeroplane and were making off across country. He also dropped an incendiary bomb on the German aeroplane, which, when last seen, was enveloped in smoke.

Our machine was damaged by the enemy's fire and forced to land 500 yards behind our trenches, where it was heavily shelled by the enemy, but was not again struck. The pilot replaced his tank during the night and succeeded in bringing his machine safely home at the dawn.

The Great War in the Air

Some weeks previously an encounter had occurred which gained for both pilot and observer a well-deserved Military Cross. Captain Robert Loraine, the famous British actor and pre-war aviator, with the Hon. Eric Lubbock for observer, had followed a German Albatross biplane from 9,000 to 600 feet, bringing it down within the British lines. This encounter was afterwards graphically described by the Hon. Eric Lubbock—an old Etonian—in the *Eton College Chronicle*.

A Gallant Actor-Airman

"Yesterday Loraine and I had an exciting adventure. We sighted a German about four miles off and attacked. We both opened fire at about fifty yards. I fired again at about twenty-five, firing twenty-six rounds, and then my gun jammed. I heard Loraine give a great shout, but felt neither fear nor triumph. Then our machine turned downwards. As I fired my last shot I had seen the German turn down. I knew if he got below us my machine-gun was the only one that could fire at him. We were diving, I standing almost on the front of the body. Then we turned level. I finished my gun, but there was no German! Both our guns (Loraine's and mine) had jammed at the same moment. I spent another five minutes at Loraine's gun; finally got both done. We saw another enemy coming in the distance. Loraine went all out to climb and attack, while I put my stiff and aching hands in my mouth praying for sufficient life to come back to them; they were frozen. Then our engine stopped and we were helpless, so we turned and glided homewards. Unable to reach the aerodrome we landed in a ploughed field—a beautiful landing.

"Loraine left me and went for help. Of course the crowd came from all sides. One Frenchman remarking, 'Vous avez l'air faim,' fetched me some beefsteak and coffee, for which I was most grateful. A 'tommy' gave me a cigarette. Well, the luckless Boche fell twenty yards behind our front line trench. The pilot was shot through the stomach; the observer, a boy of seventeen, just grazed in the head. In spite of his fall he will be all right, but yesterday he was crying and absolutely nerve-broken. No wonder, poor thing! The pilot was dead before they got him away. On the machine was found an old

The Day's Work

machine gun. It had been taken from the Canadians months ago, and now has come back to them. It is absolutely unfit for aeroplane work. There was a camera with a Zeiss lens, which will be most valuable to us, although the camera was pierced by two bullets. There were some plates which are being developed at this moment. The camera is heavy and clumsy; not a patch on ours. It is such that you cannot take a vertical photograph. There was a carbine—a very nice weapon. There was a pistol for firing coloured lights, which had been hit by us and spoiled. There was a priceless pair of binoculars, magnifying eighteen times. I am to take all these things myself to G.H.Q., which makes me very shy.

"I went to a town last night to have my hair cut. I walked with some 'tommies.' 'Lummy,' said one to the others, 'did yer see that fight in the air this morning? German fell twenty yards behind our trench.' Then followed a glowing account of the fight, with details I was unaware of. I went to a shop to buy a broom, and the shopwoman asked me if I had seen a fight this morning. I said I had. But, nevertheless, she gave me a description, gesticulating and copying our every movement. So with everyone. The Frenchman who brought me breakfast after we landed had watched it all, seen the German fall, and followed us in. Altogether it is the excitement of the land. . . . The German observer says he was given to understand that we tortured all our prisoners, and wondered when it was going to be over. He was also much surprised to hear that he was going to be taken to England, as the German Navy has control of all the seas, and England is completely cut off! . . . If my gun had not been jammed after the fight, and if another Hun had not appeared in the distance, I'd have photographed him falling, but I was much too busy at the time, seeing that we were forced to land instead of fighting the second machine. I am sorry now, but one has to act so quickly; it is the half minutes which make the difference, and to get the gun going is the most important thing."

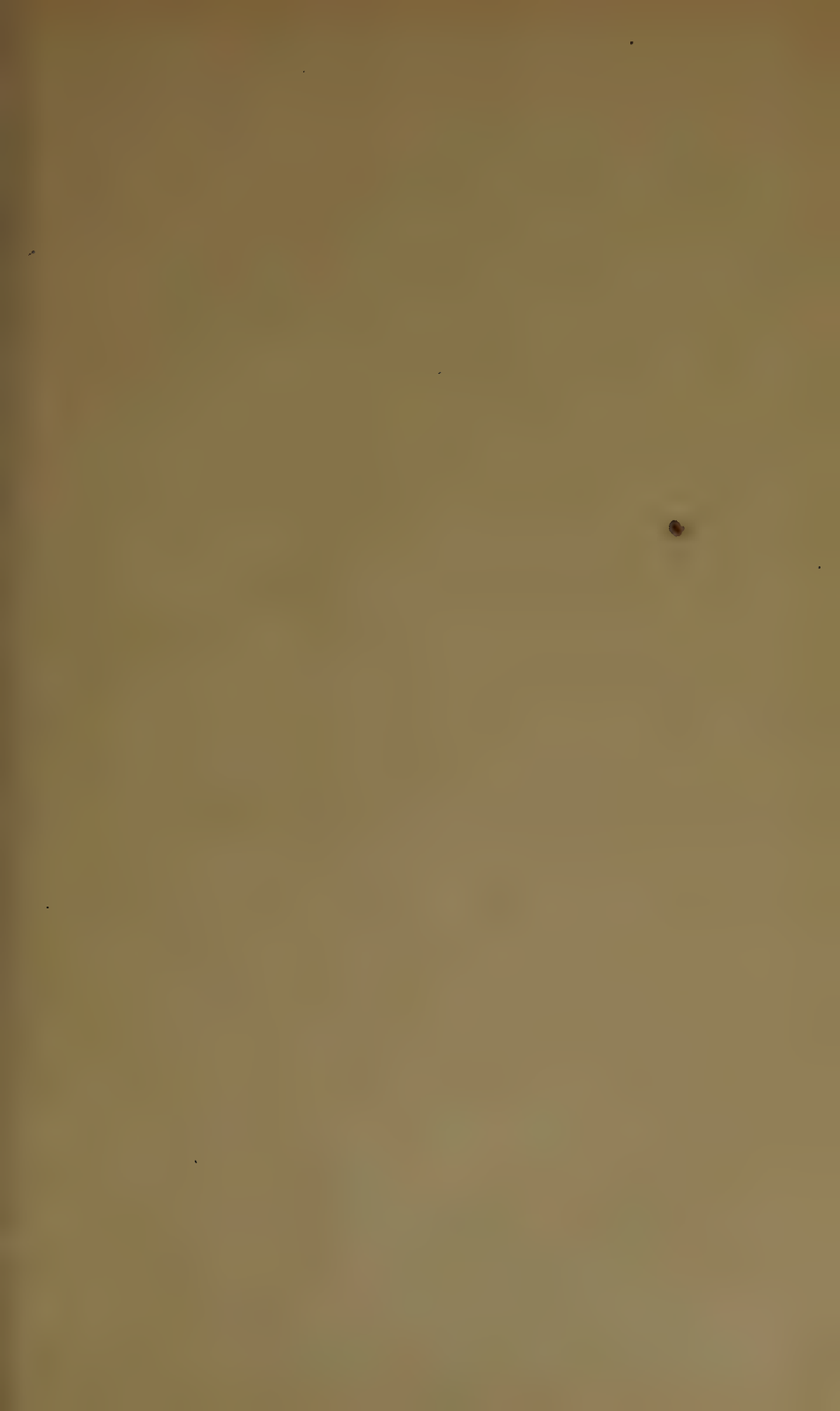
The true romance of the air creeps in at every phrase and line of this glowing personal account. It is no high-flown literary effort, but the plain unvarnished story of a soldier. With a sense of humour and appreciation, unconsciously he

The Great War in the Air

reflects the exaggerated admiration of the infantry; unconsciously, in the most stirring moments of flying over the battle a self-analysis of the emotions and sensations experienced in the day's work. Then war flying was made up eighty per cent. of emotions. To control the feelings at the time of greatest trial and to relax them—to an infinitely delicate degree—at the moment of triumph, knowing just how, and when, and where every emotion best was employed was the secret of success of the battle airmen. Flying in the cold grey dawn the feelings were dulled and blunted. At the sunset of a hard day's flying the mind was a riot of emotions. It was the most trying, tense moment of the day.

At sundown the patrols came winging home to roost; artillery observation from pottering over the lines, directing the fire of the heavy guns; reconnaissance from their long inquisitive journeys far into the enemy's country; bombers, light and proud and with their tails well up; behind, miles behind them, a significant, ruddy glow against the grey horizon of the sunset; and the fighting patrols from every high and distant nook and cranny of the skies. But not all of them always returned. Had the squadron—from C.O. to the latest-joined second-grade mechanic—gathered on the aerodrome, as they would have it appear, nonchalantly and by accident, to watch the machines come home, been asked, they would not have admitted it, but the reason for their presence was their anxiety as to the fate of those few stragglers yet across the lines.

And when they came they turned somersaults, spinning headlong in twisting tumble like a blown leaf; they looped and flew on their backs; and played hide and seek with trees, and swooped like hawks and skimmed like swallows, and towered like cranes, and drummed like snipe. Then when the last man of all had droned home the commanding officer would turn and leave the aerodrome, a happy smile wreathing his face, suggestive of the relieved anxiety of a hen for her chicks.







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